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CONTENT

CHAPTER 1

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1.1 GENERAL

The majority of land is covered in soil, a loose surface substance. A natural resource known as soil can be divided into various varieties, each of which has unique properties that either help or hinder growth. Based on the dominant particle size inside the soil, soil can be divided into the following categories: sand, clay, silt, peat, chalk, and long type of soil. The upper course and lower course are the two primary divisions of a river. The river's upper course, which is typically where it starts, has faster currents that disrupt the surface sediments, which are subsequently carried downstream and finally end up in an ocean or lake. The river's lower course is where it gets close to meeting the sea. Here, the flow is slowed, and more mud, silt, and sand are dumped into the river or the vicinity. Rivers, which constitute significant mass flexes on the surface of the globe, carry dissolved and solid loads from terrestrial realms to the oceans and through inland reservoirs. A flow carries sediment, and when the flow is overloaded due to certain circumstances, the silt is deposited. Sediments are the solid materials that has been transported and deposited to a new location. Rocks and minerals are sometimes found in sediment. It can range in size from a boulder to a sand particle. Water can carry particles like gravel or pebbles to the river and ultimately to the delta of that river. Sedimentation frequently occurs along waterfall bottoms, riverbanks, and deltas.

Sediments are solid fragments of inorganic or organic material that are carried by wind, water, or ice and are deposited as a result of soil erosion and rock weathering. They come in a variety of sizes, from enormous boulders to tiny particles. The smallest clay particles have a diameter of less than 0.002 mm. The size of slit particles is up to 0.002 to 0.05 mm and the size of sand is 0.05 to 2.0 mm.

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In order to study the distribution of Foraminifera, the calcareous microfauna, a total of 10 beach sediment samples were collected from the Vanchipura Beach. The taxonomy and systematic study were deal using Foraminifera treatises by Loeblich and Tappan, 1988 and other recent literature. Distribution pattern of individual taxon was examined and their sediment relationship was determined for ecologic/environmental interpretation. Sand-siltclay ratio estimation was carried out using the procedure of Krumbein and Pettijohn(1938).Estimation of $CaCO_3$ was made by adopting the procedure proposed by Piper (1947) has been incorporated in this dissertation. Previous research work on Foraminifera and other sedimentological parameters from the Vanchipura Beach has been reviewed and presented.

The widely utilized classification proposed by Loeblich and Tappan (1987) has been followed in the present study for Foraminiferal identification and taxonomy. A total of 7 Foraminiferal species belonging to 7 genera have been illustrated. The species belonging to *Ammonia* and *Textularia* are dominant and *Quinqueloculina* and *Eponides* are comparatively rare in their occurrence. The species of Formainifera recorded are characteristic of shallow, inner shelf to beach environment and tropical in nature.

Sedimentological parameters such as $CaCO_3$ and sand-silt-clay ratios were estimated and their distribution is discussed. An attempt has been made to evaluate the favourable substrate for the Foraminifera population abundance in the present area of study. Based on the type of the sediment samples, it is inferred that the deposition of beach sands in the Vanchipura Beach is observed to the under medium to high energy conditions. It is also reflecting on the preservation as well as the broken and much corrosive tests of Foraminifera. The colour of Foraminiferal tests indicate that the sediments are deposited under normal oxygenated environmental conditions.

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INTRODUCTION

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Micropalaeontology is a relatively new field that focuses on the study of microfossils, which can range in size from less than 1 micron to 1 cm. Due to their small size, it is possible to retrieve thousands of well-preserved specimens from a small sample of sediment or sedimentary rock, making them an excellent tool for studying environments and environmental changes.

Various groups of microfossils, such as Foraminifera, Ostracoda, Nanoplankton, dinoflagellates, acritarchs, diatoms, and radiolarians, are commonly used in biostratigraphic correlation, paleoenvironmental reconstruction, and paleoceanography. For much of the past century, micropaleontology was primarily used by the petroleum industry for subsurface correlation of geologic layers, leading to significant developments in the taxonomic, biostratigraphic, and paleoecologic aspects of the discipline.

In the 1970s, the focus shifted to interpreting deep-sea core sequences, which helped refine the geologic time scale and brought paleoceanography to the forefront of scientific research. More recently, chemical analyses of microfossils have revealed spatial and temporal variations in radioactive isotope ratios, providing insights into trends in the physical, chemical, and biological aspects of the global ecosystem, such as plate tectonics and paleoclimatology.

In addition to these new frontiers, microfossils are also useful for studying ecology and evolution, as well as environmental monitoring of aquatic environments subject to pollution from urban and industrial sources. Micropaleontology has even been used in forensic investigations.

1.2. INTRODUCTION TO FORAMINIFERA

Foraminifers, which are unicellular Protists with a hard calcium carbonate covering called a test, are primarily found in marine environments. They are sensitive to small changes in the physical and chemical characteristics of their surroundings, making them a valuable tool for studying paleoclimatic

reconstruction, sediment transport, archaeology, and more. Changes in environmental conditions are reflected in the abundance and morphology of their tests, which have a high preservation potential. Foraminifers are also useful for pollution studies and ecological/paleoecological applications, as they are abundant in sea floor sediments and can provide information on the presence and types of toxins in marine environments.

The test of forams is usually made of at least three types of hard material such as calcium carbonate, tectin and agglutinated matter. Calcium carbonate is an inorganic matter secreted by the forams and tectin tests are made of an organic material composed of complex carbohydrate and protein. The agglutinated test may be composed of very small sand grains and other particles that are cemented together. Test of forams is often less than 1 mm in diameter and may be composed of single or multiple chambers.The single-chambered test is termed as unilocular and a test having more than one chamber is described as multilocular.

Foraminifers can be found in a variety of habitats despite their small size (typically between 100 and 1000 microns) and unicellular nature. While most are marine organisms that live on the sea floor or float in the water column, some have been reported in brackish waters, lagoons, estuaries, sounds, low salinity lakes, and even some groundwater wells in Asia and North Africa. Foraminifers are useful in environmental studies because they are easily obtained, primarily live in the uppermost centimeters of sediment, and are abundant in marine and estuarine habitats.

Foraminifers are divided into three groups based on their mode of life and size: planktonic, small benthonic, and larger benthonic forms. Most foraminifers are benthonic, but several planktonic forms have adapted well to a floating habitat. Their tests have been preserved as fossils in sedimentary rocks and occur in strata that is ranging from the Cambrian to the present. Each group has evolved many different forms over time, including large, complex tests associated with coral reefs. Taxonomy, ecological distribution, and biogeography of shallow water benthic foraminifers are important for modern and fossil environmental research, providing a quick, cost-effective method of assessing the impact of pollution and other environmental changes on shallow marine biota.

Foraminifers tests can record evidence of environmental changes through time, making them a valuable source of historical baseline data even in the absence of background studies. Their small size makes them useful for applications such as petroleum exploration, where thousands of specimens can be found in small rock chips collected during drilling. Many species of foraminifers are geologically short-lived and only found in specific environments, allowing paleontologists to determine the geologic age and environment of rock formations based on the specimens found. Early work on foraminifers was conducted by d'Orbigny, Reuss, Lister, and Cushman, who defined genera and species and their geological occurrences. A Catalogue of Foraminifera was published in 1940 by Ellis and Messina, providing a comprehensive compilation of described genera.

1.2.1. APPLICATION

Foraminifera has been used for many years in biostratigraphy and has also proven to be valuable in reconstructing past environments, particularly for paleoceanography and paleoclimatology. For example, foraminifera assemblage composition has been used to determine paleobathymetry, while isotope analysis of foraminifera tests is a standard procedure for determining paleotemperature. For biostratigraphy, different types of foraminifera have shown evolutionary bursts at different periods, allowing for the use of alternative forms when one is not available. Preservation of calcareous walled foraminifera is dependent on the depth of the water column and carbonate compensation depth, so if calcareous walled foraminifera are not preserved, agglutinated forms may be used. Foraminifera has been used for biostratigraphy as far back as Upper Carboniferous to Permian strata, which have been zoned using larger benthic fusulinids. Planktonic foraminifera have become increasingly important biostratigraphic tools, especially for offshore petroleum exploration in deeper waters. The use of marker species from the Cretaceous to Recent has allowed for the development of a well-established fine scale biozonation. Benthic foraminifera have been used to determine paleobathymetry since the 1930s, and modern studies use a variety of techniques to reconstruct paleodepths, including comparing species diversity and shell-type ratios. Foraminifera can also be used to infer palaeohabitats and substrates based on test shape and morphology. Studies of modern foraminifera have recognized

correlations between test wall type, paleodepths, and salinity by plotting them onto triangular diagrams. Additionally, foraminifera can be used to identify former tsunami deposits.

1.3. SEDIMENT ANALYSIS

Sediment analysis is an important process for understanding the composition, origin, and history of sediments. One key aspect of sediment analysis is silt analysis, which focuses on the size distribution and characteristics of silt particles in a sediment sample. Silt particles are intermediate in size between sand and clay, and are typically defined as particles with a diameter between 2 and 63 microns. Silt particles can provide important information about sediment transport processes, sediment source regions, and depositional environments.

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Carbonate can be produced in both marine and terrestrial environments, as a common mineral composition in soils, sediments and rocks. Carbonate minerals in the global ocean, which are mainly involved in shallow carbonate platform sediments and deep ocean biogenic calcareous deposits, are regarded as the most significant inorganic carbon reservoir on the Earth's surface. The species, concentrations, elemental and isotopic compositions of carbonate in sediments and sedimentary rocks can be influenced by a variety of environmental and climatic factors, such as temperature, pH, precipitation, biological productivity, microbial community and hydrological conditions. Therefore, carbonate-related proxies of sediments or sedimentary rocks are widely used in paleoceanography, paleolimnology, paleoclimatology and paleoenvironmental study.

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Foraminifers are divided into three groups based on their mode of life and size: planktonic, small benthonic, and larger benthonic forms. Most foraminifers are benthonic, but several planktonic forms have adapted well to a floating habitat. Their tests have been preserved as fossils in sedimentary rocks and occur in strata that is ranging from the Cambrian to the present. Each group has evolved many different forms over time, including large, complex tests associated with coral reefs. Taxonomy, ecological distribution, and biogeography of shallow water benthic foraminifers are important for modern and fossil environmental research, providing a quick, cost-effective method of assessing the impact of pollution and other environmental changes on shallow marine biota.

Foraminifers tests can record evidence of environmental changes through time, making them a valuable source of historical baseline data even in the absence of background studies. Their small size makes them useful for applications such as petroleum exploration, where thousands of specimens can be found in small rock chips collected during drilling. Many species of foraminifers are geologically short-lived and only found in specific environments, allowing paleontologists to determine the geologic age and environment of rock formations based on the specimens found. Early work on foraminifers was conducted by d'Orbigny, Reuss, Lister, and Cushman, who defined genera and species and their geological occurrences. A Catalogue of Foraminifera was published in 1940 by Ellis and Messina, providing a comprehensive compilation of described genera.

1.2.1. APPLICATION

Foraminifera has been used for many years in biostratigraphy and has also proven to be valuable in reconstructing past environments, particularly for paleoceanography and paleoclimatology. For example, foraminifera assemblage composition has been used to determine paleobathymetry, while isotope analysis of foraminifera tests is a standard procedure for determining paleotemperature. For biostratigraphy, different types of foraminifera have shown evolutionary bursts at different periods, allowing for the use of alternative forms when one is not available. Preservation of calcareous walled foraminifera is dependent on the depth of the water column and carbonate compensation depth, so if calcareous walled foraminifera are not preserved, agglutinated forms may be used. Foraminifera has been used for biostratigraphy as far back as Upper Carboniferous to Permian strata, which have been zoned using larger benthic fusulinids. Planktonic foraminifera have become increasingly important biostratigraphic tools, especially for offshore petroleum exploration in deeper waters. The use of marker species from the Cretaceous to Recent has allowed for the development of a well-established fine scale biozonation. Benthic foraminifera have been used to determine paleobathymetry since the 1930s, and modern studies use a variety of techniques to reconstruct paleodepths, including comparing species diversity and shell-type ratios. Foraminifera can also be used to infer palaeohabitats and substrates based on test shape and morphology. Studies of modern foraminifera have recognized

correlations between test wall type, paleodepths, and salinity by plotting them onto triangular diagrams. Additionally, foraminifera can be used to identify former tsunami deposits.

1.3. SEDIMENT ANALYSIS

Sediment analysis is an important process for understanding the composition, origin, and history of sediments. One key aspect of sediment analysis is silt analysis, which focuses on the size distribution and characteristics of silt particles in a sediment sample. Silt particles are intermediate in size between sand and clay, and are typically defined as particles with a diameter between 2 and 63 microns. Silt particles can provide important information about sediment transport processes, sediment source regions, and depositional environments.

Silt analysis typically involves a combination of sediment sieving, settling, and microscopy techniques. Sediment samples are first sieved to separate out the silt fraction, which is then allowed to settle in water. The settled silt particles are then examined under a microscope to determine their size and shape characteristics. Other analytical techniques may also be used to complement silt analysis, such as X-ray diffraction (XRD) to identify mineralogical composition, and scanning electron microscopy (SEM) to examine the morphology and microstructure of silt particles. Overall, silt analysis plays an important role in sedimentology and is useful for interpreting the geological history of sedimentary environments.

Carbonate can be produced in both marine and terrestrial environments, as a common mineral composition in soils, sediments and rocks. Carbonate minerals in the global ocean, which are mainly involved in shallow carbonate platform sediments and deep ocean biogenic calcareous deposits, are regarded as the most significant inorganic carbon reservoir on the Earth's surface. The species, concentrations, elemental and isotopic compositions of carbonate in sediments and sedimentary rocks can be influenced by a variety of environmental and climatic factors, such as temperature, pH, precipitation, biological productivity, microbial community and hydrological conditions. Therefore, carbonate-related proxies of sediments or sedimentary rocks are widely used in paleoceanography, paleolimnology, paleoclimatology and paleoenvironmental study.

The Assessment Of Ground Water Quality In And Around Brahmapuram Waste Processing Plant, Ernakulam, Kerala

project report submitted to Christ College (Autonomous), University of Calicut in partial fulfilment of requirements for the award of degree in

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IN
GEOLOGY

By,

Gokuldas M K

Under the guidance of

Dr. Anso M.A
Assistant Professor

2020-2023

Department Of Geology And Environmental Science,
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Akhil NA, Namitha Lakshmi T P,
Anupam Thilakan, Kiran Joy,
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It is certified that the above statement made by the candidate is true to the best of any knowledge.

Signature of project in charge

Dr. Anso M. A
Assistant professor

Dr. Linto Alappat
HoD, Dept. of Geology and Env. Sc.

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ABSTRACT

In order to study the distribution of Foraminifera, the calcareous microfauna, a total of 10 beach sediment samples were collected from the Vanchipura Beach. The taxonomy and systematic study were deal using Foraminifera treatises by Loeblich and Tappan, 1988 and other recent literature. Distribution pattern of individual taxon was examined and their sediment relationship was determined for ecologic/environmental interpretation. Sand-siltclay ratio estimation was carried out using the procedure of Krumbein and Pettijohn(1938).Estimation of $CaCO_3$ was made by adopting the procedure proposed by Piper (1947) has been incorporated in this dissertation. Previous research work on Foraminifera and other sedimentological parameters from the Vanchipura Beach has been reviewed and presented.

The widely utilized classification proposed by Loeblich and Tappan (1987) has been followed in the present study for Foraminiferal identification and taxonomy. A total of 7 Foraminiferal species belonging to 7 genera have been illustrated. The species belonging to *Ammonia* and *Textularia* are dominant and *Quinqueloculina* and *Eponides* are comparatively rare in their occurrence. The species of Formainifera recorded are characteristic of shallow, inner shelf to beach environment and tropical in nature.

Sedimentological parameters such as $CaCO_3$ and sand-silt-clay ratios were estimated and their distribution is discussed. An attempt has been made to evaluate the favourable substrate for the Foraminifera population abundance in the present area of study. Based on the type of the sediment samples, it is inferred that the deposition of beach sands in the Vanchipura Beach is observed to the under medium to high energy conditions. It is also reflecting on the preservation as well as the broken and much corrosive tests of Foraminifera. The colour of Foraminiferal tests indicate that the sediments are deposited under normal oxygenated environmental conditions.

CHAPTER I
INTRODUCTION

1.1. INTRODUCTION

Micropalaeontology is a relatively new field that focuses on the study of microfossils, which can range in size from less than 1 micron to 1 cm. Due to their small size, it is possible to retrieve thousands of well-preserved specimens from a small sample of sediment or sedimentary rock, making them an excellent tool for studying environments and environmental changes.

Various groups of microfossils, such as Foraminifera, Ostracoda, Nanoplankton, dinoflagellates, acritarchs, diatoms, and radiolarians, are commonly used in biostratigraphic correlation, paleoenvironmental reconstruction, and paleoceanography. For much of the past century, micropaleontology was primarily used by the petroleum industry for subsurface correlation of geologic layers, leading to significant developments in the taxonomic, biostratigraphic, and paleoecologic aspects of the discipline.

In the 1970s, the focus shifted to interpreting deep-sea core sequences, which helped refine the geologic time scale and brought paleoceanography to the forefront of scientific research. More recently, chemical analyses of microfossils have revealed spatial and temporal variations in radioactive isotope ratios, providing insights into trends in the physical, chemical, and biological aspects of the global ecosystem, such as plate tectonics and paleoclimatology.

In addition to these new frontiers, microfossils are also useful for studying ecology and evolution, as well as environmental monitoring of aquatic environments subject to pollution from urban and industrial sources. Micropaleontology has even been used in forensic investigations.

1.2. INTRODUCTION TO FORAMINIFERA

Foraminifers, which are unicellular Protists with a hard calcium carbonate covering called a test, are primarily found in marine environments. They are sensitive to small changes in the physical and chemical characteristics of their surroundings, making them a valuable tool for studying paleoclimatic

reconstruction, sediment transport, archaeology, and more. Changes in environmental conditions are reflected in the abundance and morphology of their tests, which have a high preservation potential. Foraminifers are also useful for pollution studies and ecological/paleoecological applications, as they are abundant in sea floor sediments and can provide information on the presence and types of toxins in marine environments.

The test of forams is usually made of at least three types of hard material such as calcium carbonate, tectin and agglutinated matter. Calcium carbonate is an inorganic matter secreted by the forams and tectin tests are made of an organic material composed of complex carbohydrate and protein. The agglutinated test may be composed of very small sand grains and other particles that are cemented together. Test of forams is often less than 1 mm in diameter and may be composed of single or multiple chambers.The single-chambered test is termed as unilocular and a test having more than one chamber is described as multilocular.

Foraminifers can be found in a variety of habitats despite their small size (typically between 100 and 1000 microns) and unicellular nature. While most are marine organisms that live on the sea floor or float in the water column, some have been reported in brackish waters, lagoons, estuaries, sounds, low salinity lakes, and even some groundwater wells in Asia and North Africa. Foraminifers are useful in environmental studies because they are easily obtained, primarily live in the uppermost centimeters of sediment, and are abundant in marine and estuarine habitats.

Foraminifers are divided into three groups based on their mode of life and size: planktonic, small benthonic, and larger benthonic forms. Most foraminifers are benthonic, but several planktonic forms have adapted well to a floating habitat. Their tests have been preserved as fossils in sedimentary rocks and occur in strata that is ranging from the Cambrian to the present. Each group has evolved many different forms over time, including large, complex tests associated with coral reefs. Taxonomy, ecological distribution, and biogeography of shallow water benthic foraminifers are important for modern and fossil environmental research, providing a quick, cost-effective method of assessing the impact of pollution and other environmental changes on shallow marine biota.

Foraminifers tests can record evidence of environmental changes through time, making them a valuable source of historical baseline data even in the absence of background studies. Their small size makes them useful for applications such as petroleum exploration, where thousands of specimens can be found in small rock chips collected during drilling. Many species of foraminifers are geologically short-lived and only found in specific environments, allowing paleontologists to determine the geologic age and environment of rock formations based on the specimens found. Early work on foraminifers was conducted by d'Orbigny, Reuss, Lister, and Cushman, who defined genera and species and their geological occurrences. A Catalogue of Foraminifera was published in 1940 by Ellis and Messina, providing a comprehensive compilation of described genera.

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Carbonate can be produced in both marine and terrestrial environments, as a common mineral composition in soils, sediments and rocks. Carbonate minerals in the global ocean, which are mainly involved in shallow carbonate platform sediments and deep ocean biogenic calcareous deposits, are regarded as the most significant inorganic carbon reservoir on the Earth's surface. The species, concentrations, elemental and isotopic compositions of carbonate in sediments and sedimentary rocks can be influenced by a variety of environmental and climatic factors, such as temperature, pH, precipitation, biological productivity, microbial community and hydrological conditions. Therefore, carbonate-related proxies of sediments or sedimentary rocks are widely used in paleoceanography, paleolimnology, paleoclimatology and paleoenvironmental study.

ACKNOWLEDGEMENT

I would like to thank those who helped us in this project, first of all I would like to show my sincere gratitude to **Mr. Gopakumar PG, Assistant Professor, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda**, for giving this project work idea and work throughout this project work with lots of support and encouragement. I am thankful to **Dr Linto Alappat HOD, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda**, for providing whatever needed in this work and for giving good guidance, support, motivation.

I am deeply indebted to **Mr Jackson Varghese, 15th ward member of Kadukutty panchayath**, for arranging all the necessary requirements and helping us in the entire work. I would like to thank **Mr Tarun R, Mrs Roshini PP, Dr. Swetha TV, Dr. Resmi KJ, Ms Ivine Joseph, Dr. Anso MA, Dr. Sunitha D, Mrs. Shaima MM, faculties, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda,** for giving us all helps we needed. I sincerely thank **Mr. Sibin Sebastian, Assistant Professor, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda** for guiding us through various stages of our project. I would like to show special gratitude to **Dr. Rekha VB, Assistant Professor, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda,** for providing us with necessary equipment. A special thanks to **Mr Ayyappadas, research fellow of Christ College (Autonomous) Irinjalakuda,** for his valuable time and help. I also extend my gratitude to Christ college and entire family for the grateful encouragement, motivation, and love.

ABSTRACT

The Vynthala oxbow lake is studied directly in the field and also by remote sensing. An oxbow lake is a U-shaped body of water that forms when a wide meander from the main stem of a river is cut off, creating a free- standing body of water. The Vynthala oxbow lake is cut off from Chalakudy river. Analysis of the oxbow lake and its modifications through time usually involves the combination of natural as well as anthropogenic activities.

The aim of the project was to interpret the grain size characteristics of the sediments of Vynthala oxbow lake. Grain size characteristics such as sorting, skewness, kurtosis was estimated and discussed. During the month of April, 2023, the samples were collected from the oxbow lake and analyzed the characteristics. Five core samples were collected from different locations- from the starting and along the Vynthala oxbow lake and finally from the intersection point where Vynthala Oxbow Lake meets Chalakudi river. The samples were separately collected and treated and analyzed. This project provides insight on the sedimentary environment and the processes of sediment sieve analysis.

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Petrographic Studies of Granite from the Chitradurga Greenstone Belt

A PROJECT

Submitted to Christ College Autonomous, Calicut University in partial fulfilment of requirement for award of the degree

BACHELOR OF SCIENCE IN GEOLOGY

Submitted by:

MOHAMAD RIFNAS P A

DEPARTMENT OF GEOLOGY AND ENVIRONMENAL SCIENCE

CHRIST COLLEGE (AUTONOMOUS) IRINJALAKUDA, KERALA

(Affiliated to Calicut University and Re-Accredited by NAAC with A++ Grade)

May 2023

CERTIFICATE

This is to certify that the dissertation entitled "Petrographic studies of granite from the Chitradurga greenstone belt" is bona fide project work done by Navneet Premjith Menon, Nandhana Prasanth, Sakhna Sakkir, Mohamad Rifnas P A, Sai Vinayak K A, Chandana Viswanath of Christ College Irinjalakuda under the supervision and guidance of Sibin Sebastian, Department of Geology and Environment Science, Christ College (Autonomus), Irinjalakuda, during the period from April 2023 to May 2023.

Sibin Sebastian

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Dr. Linto Alappat

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Irinjalakuda, Kerala-680 125

External examiners:

DECLARATION

Hereby we declare that the dissertation work entitled "Petrographic studies of granite from the Chitradurga greenstone belt" is an original work and was carried out by us at Christ College Irinjalakuda under the supervision and guidance of Sibin Sebastian, Department of Geology and Environment Science, Christ College (Autonomus), Irinjalakuda, during the period from April 2023 to May 2023.

Navneet Premjith Menon, Nandhana Prasanth, Sakhna Sakkir, Mohamad Rifnas P A, Sai Vinayak K A, Chandana Viswanath

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It is not possible to do a project without the guidance, encouragement, and support of other people. At the very commencement of this report, I would like to extend my sincere thanks to all those who have helped me in this endeavour.

First and foremost, I would like to thank my project guide and mentor, Sibin Sebastian, Dept. of Geology and Environmental Science, Christ College (Autonomous), for designing the framework of the project, for tremendous support, and for continuously monitoring the progress of the work.

I would again like to take the opportunity to thank Sibin Sebastian (Faculty, Department of Geology, Christ College, Irinjalakuda), who has supported me throughout the entire process, both by keeping me harmonious and by helping me put the pieces together. I would like to convey my gratitude to Dr. Sunitha D., Roshni P. P., Gopakumar P. G., and Ivine Joseph (faculty, Dept. of Geology) for their guidance and support during my academics. I would like to thank Christ College faculty for their support and guidance. And last but not least, my loving parents and group mates, who have supported and encouraged me in completing the project, Also, I would like to thank all those who have willingly shared their precious time during the course of the project. I am grateful for your love and support. Thank you all.

Navneet Premjith Menon, Nandhana Prasanth, Sakhna Sakkir, Mohamad Rifnas P A, Sai Vinayak K A, Chandana Viswanath

ABSTRACT

Granitoid constitutes a major portion of the Earth's continental crust and is significant in understanding the growth and evolution of continental crust. Petrographic studies of granite involve the identification of minerals that constitute rocks and various textures. Through this, I was able to characterise the rocks and make primary inferences about their formation and differentiation. Through petrographic studies, we are trying to understand the nature of the source rocks and the petrogenetic processes of granitoid from the Chitradurga greenstone belt. Three granitic plutons in and around the belt, namely Chitradurga, Jampalnaikankote, and Hosadurga, were selected for the study.

The rock-thin sections are observed under the microscope, individually pinning out various minerals that are present in the granite. By observing through the microscope, we look at the minerals optical properties, that is, PPL and XPL observations. Throughout this process, I learnt about the mineral composition of the granite samples, which were taken from different locations. The plutons constitute different phases, including dark grey, grey, and pink granites from Chitradurga, whitish grey granite from Jampalnaikankote, and grey granite from Hosadurga. The major minerals include quartz, alkali feldspar, plagioclase, biotite, and/or hornblende in all granite samples, but occur in different proportions. The common accessory minerals include allanite, zircon, titanite, apatite, and opaques.

The presence of restitic plagioclase and biotite in some grains shows that the granites are formed from crustal sources. The mineral assemblage, including hornblende, allanite, and titanite, suggests that the sources could be metaigneous. The granites can thus be considered I-type. The primary granitic magmas might have undergone fractional crystallisation, resulting in the evolution of granite from dark grey to pink granite from Chitradurga.

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Abbreviations

Quartz - Qtz

Alkali feldspar - Kfs

Microcline - Mc

Plagioclase - Plg

Albite - Ab

Biotite -Bt

Hornblende -Hbl

Sericite -Ser

Chlorite -Chl

Garnet -Grt

Zircon -Zrc

Allanite -all

Titanite -Tit

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Signature of project in charge

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2020-2023

DEPARTMENT OF GEOLOGY AND ENVIRONMENTAL SCIENCE,
CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA,

KERALA, 680125

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

CERTIFICATE

I hereby declare that the work, which is being presented in this project, entitled **"Assessment of Surface water quality using Physico- Chemical parametersin and around Brahmapuram area, Kakkanad, Cochin"** by **Mr. Alen Mathew, Ms. Anu Lakshmi, Ms. Krishna Priya, Ms. Devika.M.S, Ms. Riswana.C.M.** submitted to the Department of Geology and Environmental Science, Christ College (Autonomous), Irinjalakuda in partial fulfilment of the requirement for the award of the Degree of Bachelor of science in Geology is an authentic record of our own work carries out under the guidance of Mrs. Roshini.P.P during the period of 2020-2023. The matter embodied in this project has not been submitted for any other degree.

Alen Mathew
Anu Lakshmi
Krishna Priya
Devika M.S
Riswana C.M

It is certified that the above statement made by the candidates is true to the best of any knowledge

Signature of project in charge

Mrs. Roshini P.P

Dr. Linto Alappat

Assistant professor and Head of Dept. of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda,Kerala-680125

Place: Irinjalakuda

Date:

External Examiner

.

DECLARATION

I hereby declare that this project work "Assessment of Surface water quality using Physico- Chemical parameters in and around Brahmapuram area, Kakkanad, Cochin" is a work done by me. No part of the report is plagiarized 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 Name:

Date: Reg no:

ACKNOWLEDGEMENT

I would like to extend my sincere heartfelt thanks for all those who supported and encouraged me to do this project , without their guidance and help I would not have been able to present the project on limited time frame.

I would also like to thank our beloved mentors, **Mrs Roshini PP , Dr Anso MA , Ms Ivine Joseph** (Assistant Professors ,Christ College (Autonomous),Irinjalakuda) and Dr Linto Alappat HoD department of Geology and Environmental Science and Mr Ayyappadas CS (Research Scholar) to providing all your information about the project and letting a helping hand for completing our project.

I thank the authorities of the Christ College (Autonomous) Irinjalakuda for giving us a labroratory and the necessary environment and equipments for successful completion of my degree.

And above all I thank almighty God for His divine benevolence and blessings showered on me, and last I thank all the helping hands who helped directly and indirectly on my way to success.

ABSTRACT

Surface water is water found on earth's surface in bodies of water such as lakes, stream, rivers, and other bodies of water.The present study is the quality analysis of surface water of Kadambrayar river. The objective is to understand the quality of water using different physical and chemical parameters such as pH, total hardness, electrical conductivity, chloride, bicarbonate, carbonate, calcium and magnesium. Twenty different samples were collected from the adjacent areas of Kadambrayar river .Physical characters are estimated using the instrument multiparameter (Eutech meter) and discussed. Chemical characters are estimated using titration method. This project is informative and has given us a whole new perspective in the subject.

CONTENTS

Petrographic Studies of Granite from the Chitradurga Greenstone Belt

A PROJECT

Submitted to Christ College Autonomous, Calicut University in partial fulfilment of requirement for award of the degree

BACHELOR OF SCIENCE IN GEOLOGY

Submitted by:

SAI VINAYAK K A

DEPARTMENT OF GEOLOGY AND ENVIRONMENAL SCIENCE

CHRIST COLLEGE (AUTONOMOUS) IRINJALAKUDA, KERALA

(Affiliated to Calicut University and Re-Accredited by NAAC with A++ Grade)

May 2023

CERTIFICATE

This is to certify that the dissertation entitled "Petrographic studies of granite from the Chitradurga greenstone belt" is bona fide project work done by Navneet Premjith Menon, Nandhana Prasanth, Sakhna Sakkir, Mohamad Rifnas P A, Sai Vinayak K A, Chandana Viswanath of Christ College Irinjalakuda under the supervision and guidance of Sibin Sebastian, Department of Geology and Environment Science, Christ College (Autonomus), Irinjalakuda, during the period from April 2023 to May 2023.

Sibin Sebastian

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Dr. Linto Alappat

Head of the Department of Geology and Env. Science

Christ College (Autonomus),

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External examiners:

DECLARATION

Hereby we declare that the dissertation work entitled "Petrographic studies of granite from the Chitradurga greenstone belt" is an original work and was carried out by us at Christ College Irinjalakuda under the supervision and guidance of Sibin Sebastian, Department of Geology and Environment Science, Christ College (Autonomus), Irinjalakuda, during the period from April 2023 to May 2023.

Navneet Premjith Menon, Nandhana Prasanth, Sakhna Sakkir, Mohamad Rifnas P A, Sai Vinayak K A, Chandana Viswanath

ACKNOWLEDGEMENT

It is not possible to do a project without the guidance, encouragement, and support of other people. At the very commencement of this report, I would like to extend my sincere thanks to all those who have helped me in this endeavour.

First and foremost, I would like to thank my project guide and mentor, Sibin Sebastian, Dept. of Geology and Environmental Science, Christ College (Autonomous), for designing the framework of the project, for tremendous support, and for continuously monitoring the progress of the work.

I would again like to take the opportunity to thank Sibin Sebastian (Faculty, Department of Geology, Christ College, Irinjalakuda), who has supported me throughout the entire process, both by keeping me harmonious and by helping me put the pieces together. I would like to convey my gratitude to Dr. Sunitha D., Roshni P. P., Gopakumar P. G., and Ivine Joseph (faculty, Dept. of Geology) for their guidance and support during my academics. I would like to thank Christ College faculty for their support and guidance. And last but not least, my loving parents and group mates, who have supported and encouraged me in completing the project, Also, I would like to thank all those who have willingly shared their precious time during the course of the project. I am grateful for your love and support. Thank you all.

Navneet Premjith Menon, Nandhana Prasanth, Sakhna Sakkir, Mohamad Rifnas P A, Sai Vinayak K A, Chandana Viswanath

ABSTRACT

Granitoid constitutes a major portion of the Earth's continental crust and is significant in understanding the growth and evolution of continental crust. Petrographic studies of granite involve the identification of minerals that constitute rocks and various textures. Through this, I was able to characterise the rocks and make primary inferences about their formation and differentiation. Through petrographic studies, we are trying to understand the nature of the source rocks and the petrogenetic processes of granitoid from the Chitradurga greenstone belt. Three granitic plutons in and around the belt, namely Chitradurga, Jampalnaikankote, and Hosadurga, were selected for the study.

The rock-thin sections are observed under the microscope, individually pinning out various minerals that are present in the granite. By observing through the microscope, we look at the minerals optical properties, that is, PPL and XPL observations. Throughout this process, I learnt about the mineral composition of the granite samples, which were taken from different locations. The plutons constitute different phases, including dark grey, grey, and pink granites from Chitradurga, whitish grey granite from Jampalnaikankote, and grey granite from Hosadurga. The major minerals include quartz, alkali feldspar, plagioclase, biotite, and/or hornblende in all granite samples, but occur in different proportions. The common accessory minerals include allanite, zircon, titanite, apatite, and opaques.

The presence of restitic plagioclase and biotite in some grains shows that the granites are formed from crustal sources. The mineral assemblage, including hornblende, allanite, and titanite, suggests that the sources could be metaigneous. The granites can thus be considered I-type. The primary granitic magmas might have undergone fractional crystallisation, resulting in the evolution of granite from dark grey to pink granite from Chitradurga.

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Figure 4.4 a) Photograph of hand specimen of grey granite from Jampalnaikankote. Thin section photographs showing b) quartz and plagioclase feldspar with lamellar twinning, c) microcline with cross hatched twinning and alkali feldspar, d) plagioclase feldspar showing lamellar twinning, e) biotite, plagioclase and alkali feldspar, and f) garnet.

Abbreviations

Quartz - Qtz

Alkali feldspar - Kfs

Microcline - Mc

Plagioclase - Plg

Albite - Ab

Biotite -Bt

Hornblende -Hbl

Sericite -Ser

Chlorite -Chl

Garnet -Grt

Zircon -Zrc

Allanite -all

Titanite -Tit

CONTENTS

ABSTRACT

In order to study the distribution of Foraminifera, the calcareous microfauna, a total of 10 beach sediment samples were collected from the Vanchipura Beach. The taxonomy and systematic study were deal using Foraminifera treatises by Loeblich and Tappan, 1988 and other recent literature. Distribution pattern of individual taxon was examined and their sediment relationship was determined for ecologic/environmental interpretation. Sand-siltclay ratio estimation was carried out using the procedure of Krumbein and Pettijohn(1938).Estimation of $CaCO_3$ was made by adopting the procedure proposed by Piper (1947) has been incorporated in this dissertation. Previous research work on Foraminifera and other sedimentological parameters from the Vanchipura Beach has been reviewed and presented.

The widely utilized classification proposed by Loeblich and Tappan (1987) has been followed in the present study for Foraminiferal identification and taxonomy. A total of 7 Foraminiferal species belonging to 7 genera have been illustrated. The species belonging to *Ammonia* and *Textularia* are dominant and *Quinqueloculina* and *Eponides* are comparatively rare in their occurrence. The species of Formainifera recorded are characteristic of shallow, inner shelf to beach environment and tropical in nature.

Sedimentological parameters such as $CaCO_3$ and sand-silt-clay ratios were estimated and their distribution is discussed. An attempt has been made to evaluate the favourable substrate for the Foraminifera population abundance in the present area of study. Based on the type of the sediment samples, it is inferred that the deposition of beach sands in the Vanchipura Beach is observed to the under medium to high energy conditions. It is also reflecting on the preservation as well as the broken and much corrosive tests of Foraminifera. The colour of Foraminiferal tests indicate that the sediments are deposited under normal oxygenated environmental conditions.

CHAPTER I
INTRODUCTION

1.1. INTRODUCTION

Micropalaeontology is a relatively new field that focuses on the study of microfossils, which can range in size from less than 1 micron to 1 cm. Due to their small size, it is possible to retrieve thousands of well-preserved specimens from a small sample of sediment or sedimentary rock, making them an excellent tool for studying environments and environmental changes.

Various groups of microfossils, such as Foraminifera, Ostracoda, Nanoplankton, dinoflagellates, acritarchs, diatoms, and radiolarians, are commonly used in biostratigraphic correlation, paleoenvironmental reconstruction, and paleoceanography. For much of the past century, micropaleontology was primarily used by the petroleum industry for subsurface correlation of geologic layers, leading to significant developments in the taxonomic, biostratigraphic, and paleoecologic aspects of the discipline.

In the 1970s, the focus shifted to interpreting deep-sea core sequences, which helped refine the geologic time scale and brought paleoceanography to the forefront of scientific research. More recently, chemical analyses of microfossils have revealed spatial and temporal variations in radioactive isotope ratios, providing insights into trends in the physical, chemical, and biological aspects of the global ecosystem, such as plate tectonics and paleoclimatology.

In addition to these new frontiers, microfossils are also useful for studying ecology and evolution, as well as environmental monitoring of aquatic environments subject to pollution from urban and industrial sources. Micropaleontology has even been used in forensic investigations.

1.2. INTRODUCTION TO FORAMINIFERA

Foraminifers, which are unicellular Protists with a hard calcium carbonate covering called a test, are primarily found in marine environments. They are sensitive to small changes in the physical and chemical characteristics of their surroundings, making them a valuable tool for studying paleoclimatic

reconstruction, sediment transport, archaeology, and more. Changes in environmental conditions are reflected in the abundance and morphology of their tests, which have a high preservation potential. Foraminifers are also useful for pollution studies and ecological/paleoecological applications, as they are abundant in sea floor sediments and can provide information on the presence and types of toxins in marine environments.

The test of forams is usually made of at least three types of hard material such as calcium carbonate, tectin and agglutinated matter. Calcium carbonate is an inorganic matter secreted by the forams and tectin tests are made of an organic material composed of complex carbohydrate and protein. The agglutinated test may be composed of very small sand grains and other particles that are cemented together. Test of forams is often less than 1 mm in diameter and may be composed of single or multiple chambers.The single-chambered test is termed as unilocular and a test having more than one chamber is described as multilocular.

Foraminifers can be found in a variety of habitats despite their small size (typically between 100 and 1000 microns) and unicellular nature. While most are marine organisms that live on the sea floor or float in the water column, some have been reported in brackish waters, lagoons, estuaries, sounds, low salinity lakes, and even some groundwater wells in Asia and North Africa. Foraminifers are useful in environmental studies because they are easily obtained, primarily live in the uppermost centimeters of sediment, and are abundant in marine and estuarine habitats.

Foraminifers are divided into three groups based on their mode of life and size: planktonic, small benthonic, and larger benthonic forms. Most foraminifers are benthonic, but several planktonic forms have adapted well to a floating habitat. Their tests have been preserved as fossils in sedimentary rocks and occur in strata that is ranging from the Cambrian to the present. Each group has evolved many different forms over time, including large, complex tests associated with coral reefs. Taxonomy, ecological distribution, and biogeography of shallow water benthic foraminifers are important for modern and fossil environmental research, providing a quick, cost-effective method of assessing the impact of pollution and other environmental changes on shallow marine biota.

Foraminifers tests can record evidence of environmental changes through time, making them a valuable source of historical baseline data even in the absence of background studies. Their small size makes them useful for applications such as petroleum exploration, where thousands of specimens can be found in small rock chips collected during drilling. Many species of foraminifers are geologically short-lived and only found in specific environments, allowing paleontologists to determine the geologic age and environment of rock formations based on the specimens found. Early work on foraminifers was conducted by d'Orbigny, Reuss, Lister, and Cushman, who defined genera and species and their geological occurrences. A Catalogue of Foraminifera was published in 1940 by Ellis and Messina, providing a comprehensive compilation of described genera.

1.2.1. APPLICATION

Foraminifera has been used for many years in biostratigraphy and has also proven to be valuable in reconstructing past environments, particularly for paleoceanography and paleoclimatology. For example, foraminifera assemblage composition has been used to determine paleobathymetry, while isotope analysis of foraminifera tests is a standard procedure for determining paleotemperature. For biostratigraphy, different types of foraminifera have shown evolutionary bursts at different periods, allowing for the use of alternative forms when one is not available. Preservation of calcareous walled foraminifera is dependent on the depth of the water column and carbonate compensation depth, so if calcareous walled foraminifera are not preserved, agglutinated forms may be used. Foraminifera has been used for biostratigraphy as far back as Upper Carboniferous to Permian strata, which have been zoned using larger benthic fusulinids. Planktonic foraminifera have become increasingly important biostratigraphic tools, especially for offshore petroleum exploration in deeper waters. The use of marker species from the Cretaceous to Recent has allowed for the development of a well-established fine scale biozonation. Benthic foraminifera have been used to determine paleobathymetry since the 1930s, and modern studies use a variety of techniques to reconstruct paleodepths, including comparing species diversity and shell-type ratios. Foraminifera can also be used to infer palaeohabitats and substrates based on test shape and morphology. Studies of modern foraminifera have recognized

correlations between test wall type, paleodepths, and salinity by plotting them onto triangular diagrams. Additionally, foraminifera can be used to identify former tsunami deposits.

1.3. SEDIMENT ANALYSIS

Sediment analysis is an important process for understanding the composition, origin, and history of sediments. One key aspect of sediment analysis is silt analysis, which focuses on the size distribution and characteristics of silt particles in a sediment sample. Silt particles are intermediate in size between sand and clay, and are typically defined as particles with a diameter between 2 and 63 microns. Silt particles can provide important information about sediment transport processes, sediment source regions, and depositional environments.

Silt analysis typically involves a combination of sediment sieving, settling, and microscopy techniques. Sediment samples are first sieved to separate out the silt fraction, which is then allowed to settle in water. The settled silt particles are then examined under a microscope to determine their size and shape characteristics. Other analytical techniques may also be used to complement silt analysis, such as X-ray diffraction (XRD) to identify mineralogical composition, and scanning electron microscopy (SEM) to examine the morphology and microstructure of silt particles. Overall, silt analysis plays an important role in sedimentology and is useful for interpreting the geological history of sedimentary environments.

Carbonate can be produced in both marine and terrestrial environments, as a common mineral composition in soils, sediments and rocks. Carbonate minerals in the global ocean, which are mainly involved in shallow carbonate platform sediments and deep ocean biogenic calcareous deposits, are regarded as the most significant inorganic carbon reservoir on the Earth's surface. The species, concentrations, elemental and isotopic compositions of carbonate in sediments and sedimentary rocks can be influenced by a variety of environmental and climatic factors, such as temperature, pH, precipitation, biological productivity, microbial community and hydrological conditions. Therefore, carbonate-related proxies of sediments or sedimentary rocks are widely used in paleoceanography, paleolimnology, paleoclimatology and paleoenvironmental study.

ACKNOWLEDGEMENT

I would like to thank those who helped us in this project, first of all I would like to show my sincere gratitude to **Mr. Gopakumar PG, Assistant Professor, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda**, for giving this project work idea and work throughout this project work with lots of support and encouragement. I am thankful to **Dr Linto Alappat HOD, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda**, for providing whatever needed in this work and for giving good guidance, support, motivation.

I am deeply indebted to **Mr Jackson Varghese, 15th ward member of Kadukutty panchayath**, for arranging all the necessary requirements and helping us in the entire work. I would like to thank **Mr Tarun R, Mrs Roshini PP, Dr. Swetha TV, Dr. Resmi KJ, Ms Ivine Joseph, Dr. Anso MA, Dr. Sunitha D, Mrs. Shaima MM, faculties, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda,** for giving us all helps we needed. I sincerely thank **Mr. Sibin Sebastian, Assistant Professor, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda** for guiding us through various stages of our project. I would like to show special gratitude to **Dr. Rekha VB, Assistant Professor, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda,** for providing us with necessary equipment. A special thanks to **Mr Ayyappadas, research fellow of Christ College (Autonomous) Irinjalakuda,** for his valuable time and help. I also extend my gratitude to Christ college and entire family for the grateful encouragement, motivation, and love.

ABSTRACT

The Vynthala oxbow lake is studied directly in the field and also by remote sensing. An oxbow lake is a U-shaped body of water that forms when a wide meander from the main stem of a river is cut off, creating a free- standing body of water. The Vynthala oxbow lake is cut off from Chalakudy river. Analysis of the oxbow lake and its modifications through time usually involves the combination of natural as well as anthropogenic activities.

The aim of the project was to interpret the grain size characteristics of the sediments of Vynthala oxbow lake. Grain size characteristics such as sorting, skewness, kurtosis was estimated and discussed. During the month of April, 2023, the samples were collected from the oxbow lake and analyzed the characteristics. Five core samples were collected from different locations- from the starting and along the Vynthala oxbow lake and finally from the intersection point where Vynthala Oxbow Lake meets Chalakudi river. The samples were separately collected and treated and analyzed. This project provides insight on the sedimentary environment and the processes of sediment sieve analysis.

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The Assessment Of Ground Water Quality In And Around Brahmapuram Waste Processing Plant, Ernakulam, Kerala

project report submitted to Christ College (Autonomous), University of Calicut in partial fulfilment of requirements for the award of degree in

BACHELOR OF SCIENCE
IN
GEOLOGY

By,

P M Ananthapadmanabhan

Reg.No:

CCAUSL030,CCAUSL058,CCAUSGL046,CCAUSGL054,CCAUSGL029,CCAUSGL053

Under the guidance of

Dr. Anso M.A
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2020-2023

Department Of Geology And Environmental Science,
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CERTIFICATE

We hereby declare that the work, which is being presented in this dissertation entitled **"Assessment Of Ground Water Quality In And Around Brahmapuram Waste Processing Plant , Ernakulam District, Kerala"** by Akhil NA, Namitha Lakshmi T P,Anupam Thilakan, Kiran Joy, P M Ananthapadmanabhan, GokuldasM K (Reg No: CCAUGL030, CCAUSL058, CCAUSGL046, CCAUGL054, CCAUSGL029, CCAUSGL053) submitted to the Department of Geology and Environmental Science Christ College (Autonomous) Irinjalakuda in partial fulfilment of the requirement for the award of the Degree of Bachelor of science in Geology is an authentic record of my own work caried out under the guidance of **Dr. ANSO M.A**, during the period of **2022-2023**. The matter embodied in this dissertation has not been submitted for any other degree.

Akhil NA, Namitha Lakshmi T P,
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It is certified that the above statement made by the candidate is true to the best of any knowledge.

Signature of project in charge

Dr. Anso M. A
Assistant professor

Dr. Linto Alappat
HoD, Dept. of Geology and Env. Sc.

Place: Irinjalakuda

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External Examiner

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II.

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ACKNOWLEDGMENT

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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 us to complete this dissertation report.

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ABSTRACT

The Vynthala oxbow lake is studied directly in the field and also by remote sensing. An oxbow lake is a U-shaped body of water that forms when a wide meander from the main stem of a river is cut off, creating a free- standing body of water. The Vynthala oxbow lake is cut off from Chalakudy river. Analysis of the oxbow lake and its modifications through time usually involves the combination of natural as well as anthropogenic activities.

The aim of the project was to interpret the grain size characteristics of the sediments of Vynthala oxbow lake. Grain size characteristics such as sorting, skewness, kurtosis was estimated and discussed. During the month of April, 2023, the samples were collected from the oxbow lake and analyzed the characteristics. Five core samples were collected from different locations- from the starting and along the Vynthala oxbow lake and finally from the intersection point where Vynthala Oxbow Lake meets Chalakudi river. The samples were separately collected and treated and analyzed. This project provides insight on the sedimentary environment and the processes of sediment sieve analysis.

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ABSTRACT

In order to study the distribution of Foraminifera, the calcareous microfauna, a total of 10 beach sediment samples were collected from the Vanchipura Beach. The taxonomy and systematic study were deal using Foraminifera treatises by Loeblich and Tappan, 1988 and other recent literature. Distribution pattern of individual taxon was examined and their sediment relationship was determined for ecologic/environmental interpretation. Sand-siltclay ratio estimation was carried out using the procedure of Krumbein and Pettijohn(1938).Estimation of $CaCO_3$ was made by adopting the procedure proposed by Piper (1947) has been incorporated in this dissertation. Previous research work on Foraminifera and other sedimentological parameters from the Vanchipura Beach has been reviewed and presented.

The widely utilized classification proposed by Loeblich and Tappan (1987) has been followed in the present study for Foraminiferal identification and taxonomy. A total of 7 Foraminiferal species belonging to 7 genera have been illustrated. The species belonging to *Ammonia* and *Textularia* are dominant and *Quinqueloculina* and *Eponides* are comparatively rare in their occurrence. The species of Formainifera recorded are characteristic of shallow, inner shelf to beach environment and tropical in nature.

Sedimentological parameters such as $CaCO_3$ and sand-silt-clay ratios were estimated and their distribution is discussed. An attempt has been made to evaluate the favourable substrate for the Foraminifera population abundance in the present area of study. Based on the type of the sediment samples, it is inferred that the deposition of beach sands in the Vanchipura Beach is observed to the under medium to high energy conditions. It is also reflecting on the preservation as well as the broken and much corrosive tests of Foraminifera. The colour of Foraminiferal tests indicate that the sediments are deposited under normal oxygenated environmental conditions.

CHAPTER I
INTRODUCTION

1.1. INTRODUCTION

Micropalaeontology is a relatively new field that focuses on the study of microfossils, which can range in size from less than 1 micron to 1 cm. Due to their small size, it is possible to retrieve thousands of well-preserved specimens from a small sample of sediment or sedimentary rock, making them an excellent tool for studying environments and environmental changes.

Various groups of microfossils, such as Foraminifera, Ostracoda, Nanoplankton, dinoflagellates, acritarchs, diatoms, and radiolarians, are commonly used in biostratigraphic correlation, paleoenvironmental reconstruction, and paleoceanography. For much of the past century, micropaleontology was primarily used by the petroleum industry for subsurface correlation of geologic layers, leading to significant developments in the taxonomic, biostratigraphic, and paleoecologic aspects of the discipline.

In the 1970s, the focus shifted to interpreting deep-sea core sequences, which helped refine the geologic time scale and brought paleoceanography to the forefront of scientific research. More recently, chemical analyses of microfossils have revealed spatial and temporal variations in radioactive isotope ratios, providing insights into trends in the physical, chemical, and biological aspects of the global ecosystem, such as plate tectonics and paleoclimatology.

In addition to these new frontiers, microfossils are also useful for studying ecology and evolution, as well as environmental monitoring of aquatic environments subject to pollution from urban and industrial sources. Micropaleontology has even been used in forensic investigations.

1.2. INTRODUCTION TO FORAMINIFERA

Foraminifers, which are unicellular Protists with a hard calcium carbonate covering called a test, are primarily found in marine environments. They are sensitive to small changes in the physical and chemical characteristics of their surroundings, making them a valuable tool for studying paleoclimatic

reconstruction, sediment transport, archaeology, and more. Changes in environmental conditions are reflected in the abundance and morphology of their tests, which have a high preservation potential. Foraminifers are also useful for pollution studies and ecological/paleoecological applications, as they are abundant in sea floor sediments and can provide information on the presence and types of toxins in marine environments.

The test of forams is usually made of at least three types of hard material such as calcium carbonate, tectin and agglutinated matter. Calcium carbonate is an inorganic matter secreted by the forams and tectin tests are made of an organic material composed of complex carbohydrate and protein. The agglutinated test may be composed of very small sand grains and other particles that are cemented together. Test of forams is often less than 1 mm in diameter and may be composed of single or multiple chambers.The single-chambered test is termed as unilocular and a test having more than one chamber is described as multilocular.

Foraminifers can be found in a variety of habitats despite their small size (typically between 100 and 1000 microns) and unicellular nature. While most are marine organisms that live on the sea floor or float in the water column, some have been reported in brackish waters, lagoons, estuaries, sounds, low salinity lakes, and even some groundwater wells in Asia and North Africa. Foraminifers are useful in environmental studies because they are easily obtained, primarily live in the uppermost centimeters of sediment, and are abundant in marine and estuarine habitats.

Foraminifers are divided into three groups based on their mode of life and size: planktonic, small benthonic, and larger benthonic forms. Most foraminifers are benthonic, but several planktonic forms have adapted well to a floating habitat. Their tests have been preserved as fossils in sedimentary rocks and occur in strata that is ranging from the Cambrian to the present. Each group has evolved many different forms over time, including large, complex tests associated with coral reefs. Taxonomy, ecological distribution, and biogeography of shallow water benthic foraminifers are important for modern and fossil environmental research, providing a quick, cost-effective method of assessing the impact of pollution and other environmental changes on shallow marine biota.

Foraminifers tests can record evidence of environmental changes through time, making them a valuable source of historical baseline data even in the absence of background studies. Their small size makes them useful for applications such as petroleum exploration, where thousands of specimens can be found in small rock chips collected during drilling. Many species of foraminifers are geologically short-lived and only found in specific environments, allowing paleontologists to determine the geologic age and environment of rock formations based on the specimens found. Early work on foraminifers was conducted by d'Orbigny, Reuss, Lister, and Cushman, who defined genera and species and their geological occurrences. A Catalogue of Foraminifera was published in 1940 by Ellis and Messina, providing a comprehensive compilation of described genera.

1.2.1. APPLICATION

Foraminifera has been used for many years in biostratigraphy and has also proven to be valuable in reconstructing past environments, particularly for paleoceanography and paleoclimatology. For example, foraminifera assemblage composition has been used to determine paleobathymetry, while isotope analysis of foraminifera tests is a standard procedure for determining paleotemperature. For biostratigraphy, different types of foraminifera have shown evolutionary bursts at different periods, allowing for the use of alternative forms when one is not available. Preservation of calcareous walled foraminifera is dependent on the depth of the water column and carbonate compensation depth, so if calcareous walled foraminifera are not preserved, agglutinated forms may be used. Foraminifera has been used for biostratigraphy as far back as Upper Carboniferous to Permian strata, which have been zoned using larger benthic fusulinids. Planktonic foraminifera have become increasingly important biostratigraphic tools, especially for offshore petroleum exploration in deeper waters. The use of marker species from the Cretaceous to Recent has allowed for the development of a well-established fine scale biozonation. Benthic foraminifera have been used to determine paleobathymetry since the 1930s, and modern studies use a variety of techniques to reconstruct paleodepths, including comparing species diversity and shell-type ratios. Foraminifera can also be used to infer palaeohabitats and substrates based on test shape and morphology. Studies of modern foraminifera have recognized

correlations between test wall type, paleodepths, and salinity by plotting them onto triangular diagrams. Additionally, foraminifera can be used to identify former tsunami deposits.

1.3. SEDIMENT ANALYSIS

Sediment analysis is an important process for understanding the composition, origin, and history of sediments. One key aspect of sediment analysis is silt analysis, which focuses on the size distribution and characteristics of silt particles in a sediment sample. Silt particles are intermediate in size between sand and clay, and are typically defined as particles with a diameter between 2 and 63 microns. Silt particles can provide important information about sediment transport processes, sediment source regions, and depositional environments.

Silt analysis typically involves a combination of sediment sieving, settling, and microscopy techniques. Sediment samples are first sieved to separate out the silt fraction, which is then allowed to settle in water. The settled silt particles are then examined under a microscope to determine their size and shape characteristics. Other analytical techniques may also be used to complement silt analysis, such as X-ray diffraction (XRD) to identify mineralogical composition, and scanning electron microscopy (SEM) to examine the morphology and microstructure of silt particles. Overall, silt analysis plays an important role in sedimentology and is useful for interpreting the geological history of sedimentary environments.

Carbonate can be produced in both marine and terrestrial environments, as a common mineral composition in soils, sediments and rocks. Carbonate minerals in the global ocean, which are mainly involved in shallow carbonate platform sediments and deep ocean biogenic calcareous deposits, are regarded as the most significant inorganic carbon reservoir on the Earth's surface. The species, concentrations, elemental and isotopic compositions of carbonate in sediments and sedimentary rocks can be influenced by a variety of environmental and climatic factors, such as temperature, pH, precipitation, biological productivity, microbial community and hydrological conditions. Therefore, carbonate-related proxies of sediments or sedimentary rocks are widely used in paleoceanography, paleolimnology, paleoclimatology and paleoenvironmental study.

Assessment of Surface water quality using Physico- Chemical parameters in and around Brahmapuram area, Kakkanad, Cochin

A project report submitted in partial fulfilment for the award of

Degree of BACHELOR OF SCIENCE *in*

GEOLOGY

By,

Anu Lakshmi

Under the guidance of

Mrs. Roshini PP

(Assistant Professor, Department of Geology & Environmental Science)

2020-2023

DEPARTMENT OF GEOLOGY AND ENVIRONMENTAL SCIENCE,
CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA,

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

CERTIFICATE

I hereby declare that the work, which is being presented in this project, entitled **"Assessment of Surface water quality using Physico- Chemical parametersin and around Brahmapuram area, Kakkanad, Cochin"** by **Mr. Alen Mathew, Ms. Anu Lakshmi, Ms. Krishna Priya, Ms. Devika.M.S, Ms. Riswana.C.M.** submitted to the Department of Geology and Environmental Science, Christ College (Autonomous), Irinjalakuda in partial fulfilment of the requirement for the award of the Degree of Bachelor of science in Geology is an authentic record of our own work carries out under the guidance of Mrs. Roshini.P.P during the period of 2020-2023. The matter embodied in this project has not been submitted for any other degree.

Alen Mathew
Anu Lakshmi
Krishna Priya
Devika M.S
Riswana C.M

It is certified that the above statement made by the candidates is true to the best of any knowledge

Signature of project in charge

Mrs. Roshini P.P

Dr. Linto Alappat

Assistant professor and Head of Dept. of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda,Kerala-680125

Place: Irinjalakuda

Date:

External Examiner

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DECLARATION

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Surface water is water found on earth's surface in bodies of water such as lakes, stream, rivers, and other bodies of water.The present study is the quality analysis of surface water of Kadambrayar river. The objective is to understand the quality of water using different physical and chemical parameters such as pH, total hardness, electrical conductivity, chloride, bicarbonate, carbonate, calcium and magnesium. Twenty different samples were collected from the adjacent areas of Kadambrayar river .Physical characters are estimated using the instrument multiparameter (Eutech meter) and discussed. Chemical characters are estimated using titration method. This project is informative and has given us a whole new perspective in the subject.

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I would like to thank **Dr. Linto Alppat**, Head of the Department, Department of Geology and Environmental science. I would convey my gratitude to **Ms.Roshni PP** and **Dr. Anso MA**(Faculty, Dept. of Geology), For the guidance and support during academics. I would be thankful to **Mr.Gopakumar P G, Mr. Tharun R, Mr. Sibin Sebastian, Dr. Swetha TV, Dr. Reshmy K J, Dr. Sunitha D, Ms. Shaima M M, Ms. Sweeshma P Dev, Mr. Ayyappadas** for helping me during field work. I would thank Christ College faculty for their support and guidance. And last but not the least my parents who have supported me for each and everything. Also, I would like to thank all those who have willingly shared their precious time during the course of project work. I would be grateful to your love and support.

ABSTRACT

The present study is about the textural characteristics of river bank sediments in Brahmapuram area, Ernakulam district. The objective was to find the percentage of clay, sand, and silt and the pH of the collected samples. The samples were collected on April-30-2023 from Kadambrayar river bank to evaluate the textural characteristic of the sediments. 10 different samples were collected from the above said location. The first two samples were collected from the river bank inside the Brahmapuram solid waste plant, the next three samples are from near Rajagiri. The collected sample is then subjected to cone and quadrant method and then 10gm is weighed after this. The collected samples were then treated with H_2O_2 to identify the organic matter present in the sample and leave it overnight. Then sodium hexametapHospHate is added to the dried sample to split up the fragments into smaller particles and leaved it overnight. Then 5gm of these sample were weighed and noted. At last, it is subjected to wet sieving. The final method is to find the pH in 20gm weighed sample which is treated with 40ml distilled water.

Kadambrayar river is located in Ernakulam district, Kerala. It is a main river that flows through Brahmapuram solid waste plant. This river is major source of water for the industrial other purposes in the Kakkanad area. The river Kadambrayar is 27km in length and it originates from hills of Keezhillam near Perumbavoor. This river merges with Vembanadu backwaters at Thevara. It is also a source of water for many grama panchayath in Thrikkakara municipality. This project has assisted us to understand the process of sediment wet sieving analysis and given us a whole new perspective on the subject.

CONTENT

CHAPTER 1

INTRODUCTION

1.1 GENERAL

The majority of land is covered in soil, a loose surface substance. A natural resource known as soil can be divided into various varieties, each of which has unique properties that either help or hinder growth. Based on the dominant particle size inside the soil, soil can be divided into the following categories: sand, clay, silt, peat, chalk, and long type of soil. The upper course and lower course are the two primary divisions of a river. The river's upper course, which is typically where it starts, has faster currents that disrupt the surface sediments, which are subsequently carried downstream and finally end up in an ocean or lake. The river's lower course is where it gets close to meeting the sea. Here, the flow is slowed, and more mud, silt, and sand are dumped into the river or the vicinity. Rivers, which constitute significant mass flexes on the surface of the globe, carry dissolved and solid loads from terrestrial realms to the oceans and through inland reservoirs. A flow carries sediment, and when the flow is overloaded due to certain circumstances, the silt is deposited. Sediments are the solid materials that has been transported and deposited to a new location. Rocks and minerals are sometimes found in sediment. It can range in size from a boulder to a sand particle. Water can carry particles like gravel or pebbles to the river and ultimately to the delta of that river. Sedimentation frequently occurs along waterfall bottoms, riverbanks, and deltas.

Sediments are solid fragments of inorganic or organic material that are carried by wind, water, or ice and are deposited as a result of soil erosion and rock weathering. They come in a variety of sizes, from enormous boulders to tiny particles. The smallest clay particles have a diameter of less than 0.002 mm. The size of slit particles is up to 0.002 to 0.05 mm and the size of sand is 0.05 to 2.0 mm.

CHAPTER 2

REVIEW OF LITRATURE

E. J. Amaral et. al in 1977 carried out a research where St. Peter Sandstone in southwestern Wisconsin was studied to determine its sedimentological texture and the environment in which it was deposited. The sandstone was found to be a fine, moderately well-sorted and nearly symmetrical. Regional and stratigrapHic variations were observed in mean and maximum grain size, sorting, and skewness, indicating changes in local paleotopograpHy and regional paleoslope.

Several techniques were used in determining the environment of deposition which included bivariate grain-size parameter combinations along with linear discriminant functions. Techniques weren't enough as they had serious flaws. Satisfactory result was achieved with two cumulative probability curve techniques and regional and stratigrapHic variations in single grain-size parameters. Based on these findings, a lower foreshore to shallow marine sand bank environment was deduced for the deposition of the St. Peter Sandstone in southwestern Wisconsin.

Susan Marriott in 1992 analyzed sediment samples collected from the Severn floodplain after severe flooding in 1990, to investigate the distribution of sediment across the floodplain. Most sand was deposited within 20 meters of the channel bank, and fine sand contributed to flood sediment across the width of the floodplain. The study used James' (1985) numerical model of overbank sedimentation to predict the transfer of sediment to the floodplain during flooding by using geometrical and hydraulic data from the Severn flood as input. The pattern of sediment concentrations predicted by the model was found to be similar to that obtained from statistical

Petrographic Studies of Granite from the Chitradurga Greenstone Belt

A PROJECT

Submitted to Christ College Autonomous, Calicut University in partial fulfilment of requirement for award of the degree

BACHELOR OF SCIENCE IN GEOLOGY

Submitted by:

CHANDANA VISWANATH

DEPARTMENT OF GEOLOGY AND ENVIRONMENAL SCIENCE

CHRIST COLLEGE (AUTONOMOUS) IRINJALAKUDA, KERALA

(Affiliated to Calicut University and Re-Accredited by NAAC with A++ Grade)

May 2023

CERTIFICATE

This is to certify that the dissertation entitled "Petrographic studies of granite from the Chitradurga greenstone belt" is bona fide project work done by Navneet Premjith Menon, Nandhana Prasanth, Sakhna Sakkir, Mohamad Rifnas P A, Sai Vinayak K A, Chandana Viswanath of Christ College Irinjalakuda under the supervision and guidance of Sibin Sebastian, Department of Geology and Environment Science, Christ College (Autonomus), Irinjalakuda, during the period from April 2023 to May 2023.

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DECLARATION

Hereby we declare that the dissertation work entitled "Petrographic studies of granite from the Chitradurga greenstone belt" is an original work and was carried out by us at Christ College Irinjalakuda under the supervision and guidance of Sibin Sebastian, Department of Geology and Environment Science, Christ College (Autonomus), Irinjalakuda, during the period from April 2023 to May 2023.

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ABSTRACT

Granitoid constitutes a major portion of the Earth's continental crust and is significant in understanding the growth and evolution of continental crust. Petrographic studies of granite involve the identification of minerals that constitute rocks and various textures. Through this, I was able to characterise the rocks and make primary inferences about their formation and differentiation. Through petrographic studies, we are trying to understand the nature of the source rocks and the petrogenetic processes of granitoid from the Chitradurga greenstone belt. Three granitic plutons in and around the belt, namely Chitradurga, Jampalnaikankote, and Hosadurga, were selected for the study.

The rock-thin sections are observed under the microscope, individually pinning out various minerals that are present in the granite. By observing through the microscope, we look at the minerals optical properties, that is, PPL and XPL observations. Throughout this process, I learnt about the mineral composition of the granite samples, which were taken from different locations. The plutons constitute different phases, including dark grey, grey, and pink granites from Chitradurga, whitish grey granite from Jampalnaikankote, and grey granite from Hosadurga. The major minerals include quartz, alkali feldspar, plagioclase, biotite, and/or hornblende in all granite samples, but occur in different proportions. The common accessory minerals include allanite, zircon, titanite, apatite, and opaques.

The presence of restitic plagioclase and biotite in some grains shows that the granites are formed from crustal sources. The mineral assemblage, including hornblende, allanite, and titanite, suggests that the sources could be metaigneous. The granites can thus be considered I-type. The primary granitic magmas might have undergone fractional crystallisation, resulting in the evolution of granite from dark grey to pink granite from Chitradurga.

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Figure 4.4 a) Photograph of hand specimen of grey granite from Jampalnaikankote. Thin section photographs showing b) quartz and plagioclase feldspar with lamellar twinning, c) microcline with cross hatched twinning and alkali feldspar, d) plagioclase feldspar showing lamellar twinning, e) biotite, plagioclase and alkali feldspar, and f) garnet.

Abbreviations

Quartz - Qtz

Alkali feldspar - Kfs

Microcline - Mc

Plagioclase - Plg

Albite - Ab

Biotite -Bt

Hornblende -Hbl

Sericite -Ser

Chlorite -Chl

Garnet -Grt

Zircon -Zrc

Allanite -all

Titanite -Tit

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Signature of project in charge

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Date:

External Examiner

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BACHELOR OF SCIENCE IN GEOLOGY

Submitted by:

NANDHANA PRASANTH

DEPARTMENT OF GEOLOGY AND ENVIRONMENAL SCIENCE

CHRIST COLLEGE (AUTONOMOUS) IRINJALAKUDA, KERALA

(Affiliated to Calicut University and Re-Accredited by NAAC with A++ Grade)

May 2023

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I am deeply indebted to **Mr Jackson Varghese, 15th ward member of Kadukutty panchayath**, for arranging all the necessary requirements and helping us in the entire work. I would like to thank **Mr Tarun R, Mrs Roshini PP, Dr. Swetha TV, Dr. Resmi KJ, Ms Ivine Joseph, Dr. Anso MA, Dr. Sunitha D, Mrs. Shaima MM, faculties, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda,** for giving us all helps we needed. I sincerely thank **Mr. Sibin Sebastian, Assistant Professor, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda** for guiding us through various stages of our project. I would like to show special gratitude to **Dr. Rekha VB, Assistant Professor, Department of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda,** for providing us with necessary equipment. A special thanks to **Mr Ayyappadas, research fellow of Christ College (Autonomous) Irinjalakuda,** for his valuable time and help. I also extend my gratitude to Christ college and entire family for the grateful encouragement, motivation, and love.

ABSTRACT

The Vynthala oxbow lake is studied directly in the field and also by remote sensing. An oxbow lake is a U-shaped body of water that forms when a wide meander from the main stem of a river is cut off, creating a free- standing body of water. The Vynthala oxbow lake is cut off from Chalakudy river. Analysis of the oxbow lake and its modifications through time usually involves the combination of natural as well as anthropogenic activities.

The aim of the project was to interpret the grain size characteristics of the sediments of Vynthala oxbow lake. Grain size characteristics such as sorting, skewness, kurtosis was estimated and discussed. During the month of April, 2023, the samples were collected from the oxbow lake and analyzed the characteristics. Five core samples were collected from different locations- from the starting and along the Vynthala oxbow lake and finally from the intersection point where Vynthala Oxbow Lake meets Chalakudi river. The samples were separately collected and treated and analyzed. This project provides insight on the sedimentary environment and the processes of sediment sieve analysis.

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INTRODUCTION

GENERAL

Oxbow Lake is a lake found in a river channel's abandoned meander loop, formed by U-shaped or curved bends of a river that are blocked off from the main river flow. The terminus of the meander loop becomes closer and closer due to constant erosion and deposition along the edges of the meanders. The meander loops eventually shut themselves off from the river, generating oxbow lake. The outer curve of a meander can be exaggerated to the point where the inner ends of the loop become isolated from the main channel and live as independent water entities known as oxbow lakes as a result of intense erosion action. In time, these bodies of water will be transformed into swamps in favorable settings.

Vynthala Oxbow was produced by the cutoff of the Chalakudy River. The lake is the only naturally created Oxbow Lake in the entire state of Kerala. Landscape changes, transformations and conversions, are results of various pressures on ecosystems and have been progressing largely in concert with human settlements. Land use change is the modification in the purpose and usage of the land, which is not necessarily the only change in land cover (Verburg, et al, 2000). The composition and structure of vegetation can serve as bio-indicators for environmental changes to ecosystems that echo the interactions between human activity and the natural environment (Zhang et al., 2008). The land cover and landscape change in semi-arid and arid environments often reflects the most significant impact on the environment due to excessive human activity (Zhou et al., 2008a and Zhou et al., 2008b). Accurate and up-to-date land cover change information is necessary to understand and assess the environmental consequences of such changes. Accurate and up-to-date land cover change information is necessary to understand and assess the environmental consequences of such changes.

Assessment of Surface water quality using Physico- Chemical parameters in and around Brahmapuram area, Kakkanad, Cochin

A project report submitted in partial fulfilment for the award of

Degree of BACHELOR OF SCIENCE *in*

GEOLOGY

By

Allen Mathew

Under the guidance of

Mrs. Roshini PP

(Assistant Professor, Department of Geology & Environmental Science)

2020-2023

DEPARTMENT OF GEOLOGY AND ENVIRONMENTAL SCIENCE,
CHRIST COLLEGE (AUTONOMOUS), IRINJALAKUDA,

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

CERTIFICATE

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Alen Mathew
Anu Lakshmi
Krishna Priya
Devika M.S
Riswana C.M

It is certified that the above statement made by the candidates is true to the best of any knowledge

Signature of project in charge

Mrs. Roshini P.P

Dr. Linto Alappat

Assistant professor and Head of Dept. of Geology and Environmental Science, Christ College (Autonomous) Irinjalakuda,Kerala-680125

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Surface water is water found on earth's surface in bodies of water such as lakes, stream, rivers, and other bodies of water.The present study is the quality analysis of surface water of Kadambrayar river. The objective is to understand the quality of water using different physical and chemical parameters such as pH, total hardness, electrical conductivity, chloride, bicarbonate, carbonate, calcium and magnesium. Twenty different samples were collected from the adjacent areas of Kadambrayar river .Physical characters are estimated using the instrument multiparameter (Eutech meter) and discussed. Chemical characters are estimated using titration method. This project is informative and has given us a whole new perspective in the subject.

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ABSTRACT

The present study is about the textural characteristics of river bank sediments in Brahmapuram area, Ernakulam district. The objective was to find the percentage of clay, sand, and silt and the pH of the collected samples. The samples were collected on April-30-2023 from Kadambrayar river bank to evaluate the textural characteristic of the sediments. 10 different samples were collected from the above said location. The first two samples were collected from the river bank inside the Brahmapuram solid waste plant, the next three samples are from near Rajagiri. The collected sample is then subjected to cone and quadrant method and then 10gm is weighed after this. The collected samples were then treated with H_2O_2 to identify the organic matter present in the sample and leave it overnight. Then sodium hexametapHospHate is added to the dried sample to split up the fragments into smaller particles and leaved it overnight. Then 5gm of these sample were weighed and noted. At last, it is subjected to wet sieving. The final method is to find the pH in 20gm weighed sample which is treated with 40ml distilled water.

Kadambrayar river is located in Ernakulam district, Kerala. It is a main river that flows through Brahmapuram solid waste plant. This river is major source of water for the industrial other purposes in the Kakkanad area. The river Kadambrayar is 27km in length and it originates from hills of Keezhillam near Perumbavoor. This river merges with Vembanadu backwaters at Thevara. It is also a source of water for many grama panchayath in Thrikkakara municipality. This project has assisted us to understand the process of sediment wet sieving analysis and given us a whole new perspective on the subject.

CONTENT

CHAPTER 1

INTRODUCTION

1.1 GENERAL

The majority of land is covered in soil, a loose surface substance. A natural resource known as soil can be divided into various varieties, each of which has unique properties that either help or hinder growth. Based on the dominant particle size inside the soil, soil can be divided into the following categories: sand, clay, silt, peat, chalk, and long type of soil. The upper course and lower course are the two primary divisions of a river. The river's upper course, which is typically where it starts, has faster currents that disrupt the surface sediments, which are subsequently carried downstream and finally end up in an ocean or lake. The river's lower course is where it gets close to meeting the sea. Here, the flow is slowed, and more mud, silt, and sand are dumped into the river or the vicinity. Rivers, which constitute significant mass flexes on the surface of the globe, carry dissolved and solid loads from terrestrial realms to the oceans and through inland reservoirs. A flow carries sediment, and when the flow is overloaded due to certain circumstances, the silt is deposited. Sediments are the solid materials that has been transported and deposited to a new location. Rocks and minerals are sometimes found in sediment. It can range in size from a boulder to a sand particle. Water can carry particles like gravel or pebbles to the river and ultimately to the delta of that river. Sedimentation frequently occurs along waterfall bottoms, riverbanks, and deltas.

Sediments are solid fragments of inorganic or organic material that are carried by wind, water, or ice and are deposited as a result of soil erosion and rock weathering. They come in a variety of sizes, from enormous boulders to tiny particles. The smallest clay particles have a diameter of less than 0.002 mm. The size of slit particles is up to 0.002 to 0.05 mm and the size of sand is 0.05 to 2.0 mm.

CHAPTER 2

REVIEW OF LITRATURE

E. J. Amaral et. al in 1977 carried out a research where St. Peter Sandstone in southwestern Wisconsin was studied to determine its sedimentological texture and the environment in which it was deposited. The sandstone was found to be a fine, moderately well-sorted and nearly symmetrical. Regional and stratigrapHic variations were observed in mean and maximum grain size, sorting, and skewness, indicating changes in local paleotopograpHy and regional paleoslope.

Several techniques were used in determining the environment of deposition which included bivariate grain-size parameter combinations along with linear discriminant functions. Techniques weren't enough as they had serious flaws. Satisfactory result was achieved with two cumulative probability curve techniques and regional and stratigrapHic variations in single grain-size parameters. Based on these findings, a lower foreshore to shallow marine sand bank environment was deduced for the deposition of the St. Peter Sandstone in southwestern Wisconsin.

Susan Marriott in 1992 analyzed sediment samples collected from the Severn floodplain after severe flooding in 1990, to investigate the distribution of sediment across the floodplain. Most sand was deposited within 20 meters of the channel bank, and fine sand contributed to flood sediment across the width of the floodplain. The study used James' (1985) numerical model of overbank sedimentation to predict the transfer of sediment to the floodplain during flooding by using geometrical and hydraulic data from the Severn flood as input. The pattern of sediment concentrations predicted by the model was found to be similar to that obtained from statistical

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ABSTRACT

The Vynthala oxbow lake is studied directly in the field and also by remote sensing. An oxbow lake is a U-shaped body of water that forms when a wide meander from the main stem of a river is cut off, creating a free- standing body of water. The Vynthala oxbow lake is cut off from Chalakudy river. Analysis of the oxbow lake and its modifications through time usually involves the combination of natural as well as anthropogenic activities.

The aim of the project was to interpret the grain size characteristics of the sediments of Vynthala oxbow lake. Grain size characteristics such as sorting, skewness, kurtosis was estimated and discussed. During the month of April, 2023, the samples were collected from the oxbow lake and analyzed the characteristics. Five core samples were collected from different locations- from the starting and along the Vynthala oxbow lake and finally from the intersection point where Vynthala Oxbow Lake meets Chalakudi river. The samples were separately collected and treated and analyzed. This project provides insight on the sedimentary environment and the processes of sediment sieve analysis.

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The Assessment Of Ground Water Quality In And Around Brahmapuram Waste Processing Plant, Ernakulam, Kerala

project report submitted to Christ College (Autonomous), University of Calicut in partial fulfilment of requirements for the award of degree in

BACHELOR OF SCIENCE
IN
GEOLOGY

By,

Anupam Thilakan

Reg.No:

CCAUSL030,CCAUSL058,CCAUSGL046,CCAUSGL054,CCAUSGL029,CCAUSGL053

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CERTIFICATE

We hereby declare that the work, which is being presented in this dissertation entitled **"Assessment Of Ground Water Quality In And Around Brahmapuram Waste Processing Plant , Ernakulam District, Kerala"** by Akhil NA, Namitha Lakshmi T P,Anupam Thilakan, Kiran Joy, P M Ananthapadmanabhan, GokuldasM K (Reg No: CCAUGL030, CCAUSL058, CCAUSGL046, CCAUGL054, CCAUSGL029, CCAUSGL053) submitted to the Department of Geology and Environmental Science Christ College (Autonomous) Irinjalakuda in partial fulfilment of the requirement for the award of the Degree of Bachelor of science in Geology is an authentic record of my own work caried out under the guidance of **Dr. ANSO M.A**, during the period of **2022-2023**. The matter embodied in this dissertation has not been submitted for any other degree.

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It is certified that the above statement made by the candidate is true to the best of any knowledge.

Signature of project in charge

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Place: Irinjalakuda

Date:

External Examiner

I.

II.

DECLARATION

I hereby declare that this dissertation work **"Assessment Of Ground Water Quality In And Around Brahmapuram Waste Processing Plant , Ernakulam District, Kerala"** is a work done by us. No part of the report is plagiarized from other resources. All information included from other sources has been duly acknowledged. We maintain that if any part of the report is found to be plagiarized, I shall take the full responsibility for it.

Place: Irinjalakuda

Date:

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