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Chemical Composition of the Essential Oils from Stem, Root, Fruit and Leaf of Piper longum Linn

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A STUDY ON THE BUYING BEHAVIOR OF WOMEN CUSTOMERS TOWARDS COSMETIC PRODUCTS WITH SPECIAL REFERENCE TO IRINJALAKUDA TOWN.

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Abstract
Modern world considers physical appearance as one of the most important factors affecting our personality. Cosmetics provide one way to improve our physical appearance. Generally, we assume that female population is the major user of cosmetic products. So this study focuses on analyzing the attitude of women towards the purchase of cosmetic products and thereby the future prospects for cosmetic dealers in Irinjalakuda town.
***Key words**: Cosmetics, attitude, buying behavior.*

1.1. Introduction

Aesthetic make up products is being used since olden days. We today call them as cosmetics. The word "cosmetics" is derived from the Greek word "Kosmetikos" which means "skilled at decorating". Cosmetics colloquially known as makeup are care substances used to enhance the appearance or odor of the human body. The US; Food and Drug Administration(FDA), which regulates cosmetics, defines cosmetics as "intended to be applied to the human body for cleansing, beautifying, promoting attractiveness, or altering the appearance without affecting the body's structure or functions".

According to Euromonitor, the cosmetics and toiletries is divided into eleven categories which are body care, colour cosmetic, bath and shower products, deodorants, hair care, men's grooming products, oral hygiene, fragrances, skin care, depilatories and skin care.

Since 1991, with the liberalization along with the crowning of many Indian women at international beauty pageants, the cosmetic industry has come into the limelight in a bigger way. Subsequently there has been a change in the cosmetic consumption and this trend is fueling growth in the cosmetic sector. Indian cosmetic industry had rapid growth in the last couple of years, growing at a CAGR of around 7.5% between 2006 and 2008. This is mainly due to increasing purchasing power and fashion consciousness. In the Indian cosmetic industry, both electronic as well as print media are playing an important role in spreading awareness about the cosmetic products and developing fashion consciousness among the Indian consumers.

Due to the development of satellite television and a number of television channels as well as the internet in the modern day, the Indian consumers are constantly being updated about new cosmetic products, translating into the desire to purchase them.

Additionally, the flourishing Indian fashion/film industry is fueling growth into the cosmetic industry in India by making Indians to realize the importance of having good looks and appearances. Today most of the cosmetics manufacturers in India cater to the domestic market but they are gradually establishing their footholds in overseas market. Indian herbal cosmetic products have a tremendous demand in the international market.

1.2 Review of Literature

Hoyer, Deborah (2001)[1] According to them the consumer behavior influences in three aspects, they are acquiring, using and disposing. Acquiring means how the consumer spends money on the products, such as leasing, trading and borrowing. Using means some of the consumers use the high priced products and some of the consumers see the quality. Disposing means distribution, order or that places a particular product.

Kerin et al, (2003)[2] According to them lifestyle is a way of living that is identified by how people spend their time and resources, what they consider important in their environment and what they think themselves and the world around them. Personality, motives and attitudes also influences lifestyle.

Kotler and Keller (2009)[3] Attitudes are formed through experience and learning and that attitudes influence buying behavior. Consumer attitudes towards a firm and its products greatly influence the success or failure of the firm.

Solomon, (2009)[4] According to him the concept of lifestyle provide a description of behavior and purchase pattern, especially the ways in which people spend their money and time. Personality, motives and attitudes also influences lifestyle. Lifestyle defines a pattern of consumption.

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"STUDY ON THE TRIPLE BOTTOM LINE CONTRIBUTION OF ITC LTD"

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Abstract
Business enterprises are economic organs of society and draw on societal resources; it is ITC's belief that a company's performance must be measured by its Triple Bottom Line contribution to building economic, social and environmental capital towards enhancing societal sustainability. ITC believes that in the strategic context of business, enterprises possess, beyond mere financial resources, the transformational capacity to create game-changing development models by unleashing their power of entrepreneurial vitality, innovation and creativity. In line with this belief, ITC will continue crafting unique models to generate livelihoods and environmental capital. Such Corporate Social Responsibility ("CSR") projects are far more replicable, scalable and sustainable, with a significant multiplier impact on sustainable livelihood creation and environmental replenishment. These initiatives are independent of the normal conduct of ITC's business. To identify the programmes, projects and activities (collectively "CSR Programmes") carried out in ITC are the main theme of this paper.

Key Words: Corporate Social Responsibility ("CSR").

1.1 Introduction

Corporate social responsibility (CSR, also called corporate conscience, corporate citizenship or responsible business) is a form of corporate self-regulation integrated into a business model. CSR policy functions as a self-regulatory mechanism whereby a business monitors and ensures its active compliance with the spirit of the law, ethical standards and national or international norms. With some models, a firm's implementation of CSR goes beyond compliance and engages in "actions that appear to further some social good, beyond the interests of the firm and that which is required by law." The aim is to increase long-term profits and shareholder trust through positive public relations and high ethical standards to reduce business and legal risk by taking responsibility for corporate actions. CSR strategies encourage the company to make a positive impact on the environment and stakeholders including consumers, employees, investors, communities, and others.

CSR is titled to aid an organization's mission as well as serve as a guide to what the company represents for its consumers. Business ethics is the part of applied ethics that examines ethical principles and moral or ethical problems that can arise in a business environment. ISO 26000 is the recognized international standard for CSR. Public sector organizations (the United Nations for example) adhere to the triple bottom line (TBL). It is widely accepted that CSR adheres to similar principles, but with no formal act of legislation. As per the statistical report in the year 2015 among the six FMCG companies the major contributor in CSR is ITC Ltd. Thus This paper focus on the programmes, projects and activities (collectively "CSR Programmes") carried out in ITC Ltd. ITC's belief that a company's performance must be measured by its Triple Bottom Line contribution to building economic, social and environmental capital towards enhancing societal sustainability. ITC believes that in the strategic context of business, enterprises possess, beyond mere financial resources, the transformational capacity to create game-changing development models by unleashing their power of entrepreneurial vitality, innovation and creativity. In line with this belief, ITC will continue crafting unique models to generate livelihoods and environmental capital. Such Corporate Social Responsibility ("CSR") projects are far more replicable, scalable and sustainable, with a significant multiplier impact on sustainable livelihood creation and environmental replenishment. These initiatives are independent of the normal conduct of ITC's business.

1.2 Objectives of the study

1. To identify the programmes, projects and activities (collectively "CSR Programmes") carried out in ITC Ltd.
2. To analyse the CSR expenditure of ITC Ltd among the FMCG companies.

2.1 The major CSR interventions of ITC Ltd.

ITC has made a far-reaching contribution to the national cause of livelihood creation, particularly in rural India. The Company's integrated rural development programme has helped create a vibrant rural eco-system empowering farmers, enriching the environment and raising rural incomes. These innovative interventions have reached meaningful scale given the core focus on empowerment and co-creation, development of institutional frameworks and capacity building at the grass-roots. By adopting a 360 degree approach to enriching rural eco-systems, ITC has put in place long term drivers that will contribute meaningfully to the national priority of employment generation and sustainable growth.

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A STUDY ON PERFORMANCE EVALUATION OF ICICI PRUDENTIAL MUTUAL FUND WITH SPECIAL REFERENCE TO EQUITY PRODUCTS (BOTH DIRECT AND REGULAR PLAN)

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Abstract
Mutual fund is not an alternative investment option to stocks and bonds; rather it pools the money of several investors and invests this in stocks, bonds, money market instruments and other types of securities. Buying a mutual fund is like buying a small slice of a big pizza. The owner of a mutual fund unit gets a proportional share of the fund's gains, losses, income and expenses. Therefore the aim of study is to evaluate the performance of ICICI Prudential mutual funds with special reference to Equity products (Both Direct and Regular plan).

Key words: Mutual fund, Direct and Regular plan, ICICI Prudential etc.

1.1 Introduction

Mutual Funds are becoming popular over the last 20 years. It is a type of professionally managed collective investment vehicle. Mutual funds have become a widely popular and effective way for investors to participate in financial markets in an easy, low cost fashion. It can play a central role in an individual's investment strategy. They offer the potential for capital growth and income through investment performance, dividends and distributions under the guidance of a portfolio manager who makes investment decisions on behalf of mutual fund unit holders. Over the past decade, mutual funds have increasingly become the investor's vehicles of choice for long term investment. The relationship between risk and return determines the performance of a mutual fund scheme. Many asset management companies are working in India, so it is necessary to study the performance of it which may be useful for the investors to select the right mutual fund.

1.2 Review of Literature

In this section, related literatures in performance of mutual funds are reviewed. So the present study is the first attempt to analyze the performance of ICICI prudential mutual fund. Studies conducted in various aspects related to performance of mutual fund were found to be few in number. Among them no comprehensive study has been done in this area.

Sharpe (1966)[1] He evaluate the risk adjusted performance of mutual fund and introduced a measure known as reward to variability ratio (currently Sharpe ratio).with the help of this ratio he evaluate the return of 34 open ended mutual fund in the period 1945-1913.The return showed that to a major extent the capital market was highly efficient. But majority of the sample had lower performance as compared to Dow Jones Index.

Michael c Jensen (1967)[2] derived a risk adjusted measure of portfolio performance known as Jensen alpha. He estimated how much a manager's forecasting ability contributes to fund's return.

.MC Donald (1974)[3] conducted a research to examine the objectives and performance (risk and return) of American mutual funds in the period 1960-1969. Sample of 123 American mutual funds was analyzed by using Treynor (1965) and Sharpe indexes. The results indicated that stated objectives were significantly related to subsequent measures of systematic risk and total variability. Therefore the funds with aggressive objectives generally produced better performance.

A research conducted by **Martin et. al (1993)** [4]to examine the performance of bond mutual funds. Samples of bond fund: first sample was designed to eliminate survivorship bias and was comprised of the46 non- municipal bonds for the 10 year period from the beginning of 1979 to the end of 1988. The second sample consisted of all bond funds that existed at the end of 1991. The Researcher used linear and non-linear models in order to examine the two samples. The results showed that bond funds under perform relevant indexes post expenses.

Redman (2000)[4] analyzed the risk adjusted returns for five portfolios of international mutual funds. The study was conducted for three periods.1985-1994, 1985-1989, and 1990-1994.The performance was measured by using Treynor (1965) index, Sharpe (1966)'s index and Jensen's alpha and comparison was made with the U.S market. Results showed that under Sharpe (1966)'s and Treynor (1965) indices the performance of portfolios of international mutual fund was higher than the U.S market from 1985-1994 and 1985-1989. On the other hand performance of U.S equity portfolio and market index was higher the global portfolios from1990-1994

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"A study on working capital Management of ITC Ltd".

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Abstract:
Working capital is essential to maintain the smooth running of business. Every business concern is needed adequate working capital to run its business. Adequate working capital is maintained the solvency and creating the goodwill of the company. It creates the environment security, confidence, and high morale and overall efficiency of the business. Working capital management of a firm has a great effect in its profitability, liquidity and structural health of the organization .Proper management of working capital is essential for every business. This paper focuses on the study of working capital management of ITC Ltd and analyse its efficiency in performance.
Key words: *Working capital management of ITC Ltd. Performance Index (PI) Utilization Index (UI) Efficiency Index (EI) as product of PI and UI.*

Part 1

1.1 Introduction

Finance is the lifeblood and nerve center of a business. It is the crucial factor in the establishment and success of any concern. Every business needs funds for two purposes -for its establishment and to carry out its day to day operations. The most effective utilization of capital requires the establishment of sound and consistent management policies. Capital required for a concern can be classified in two, fixed capital and working capital. Fixed capital allows production capacity. Funds that are invested in current assets are known as working capital. Working capital refers to that part of the firm capital, which is required for financing short term or current assets such as cash, receivables and inventories. The need for working capital arises due to the time gap between production and realization of cash from sales.

Working capital management is concerned with management of current assets. One aspects of the working capital management is the tradeoff between profitability and risk. If the firm does not have adequate working capital, it may become illiquid and constantly may not have the ability to meet its current obligations. Current assets and current liabilities are adversely affected in the profitability. Ensure a tradeoff between profitability and liquidity is one of the major dimensions of working capital management. Adequate and appropriate working capital financing ensures that the firm has sufficient cash flows to pay its bills, as if a waits the full collection of revenue. Working capital is the light of any industry. Working capital should be optimum to run the business operation in most effective manner. The excess or shortage of working capital would be dangerous to any business. The excessive working capital can be result into reduce profits, unnecessary purchasing, accumulation of inventories, defective debtors, defective credit policy and lesser efficiency in organization. Inadequate working capital result in difficulty for the firm to exploit favorable market condition and it also leads to inefficiencies, increased cost, reduced profits etc. The availability of adequate working capital is must for every business. It is enhance the liquidity, solvency and credit worthiness of the concern. It is possible to meet the unseen contingencies and utilize the fixed assets. It also increases the profitability of the business. Here an attempt is made to analyse the efficiency in the working capital management of ITC Ltd.

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POLLUTION STRESS ASSESSMENT OF OXBOW LAKE IN KERALA

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ABSTRACT

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. Oxbow lakes are Shallow open waters. They are small bodies of standing or gently flowing water that represent a transitional stage between lakes and marshes. "Kanichan thura" at Vynthala is considered to be the only one naturally formed "Ox-bow" lake in Kerala. Now the pollution load of this lake is high due to anthropogenic activities. Physical and chemical properties of water are the most important factors responsible in shaping the biotic communities. A shift in the desired level of physio chemical properties affect the productivity chain adversely and as a result the entire aquatic productivity equilibrium is disturbed. The present study identify the water and sediment pollution level by analysisng the different water and sediment quality parameters. The different water parameters analysed are pH, TDS, conductivity, alkalinity, acidity, BOD, COD etc. During the present study realized that the oxbow lake at Kanichamthura is a precious natural resource. It holds The ox-bow lakes are very potent biologically and thus are capable to generate better economic environment, provided certain management practices are employed. At the present, as the lakes are poorly managed. The lake is under threat. It needs urgent care and protection as it is a part of our natural heritage and should remain as specimen for the generations to come.

KEYWORDS: Oxbow Lake, Pollution, Kanichamthura, Natural Resource

INTRODUCTION

The origin of ox-bow lake is a complex phenomenon and in this process many natural and human forces are involved. The genesis of the formation of lake basins has been identified as constructive, destructive or obstructive by geomorphologists and they have attributed seven main reasons for their origin, such as.(i)Tectonic activities (ii) land slides (iii) glacial activity (iv) drifting activity (v)volcanic activity (vi) solution activity and (vii) fluviatile activity. Thus nomenclature for such lakes has originated from United States and is derived from resemblance In shape to the wooden U-shaped collar placed around the neck of a draft-ox and attached to the yoke (Hutchinson 1957) Oxbow-lakes belong to semi-natural wetlands(Zsofia Molnar.2013), which are rare in South India as well. Oxbow lakes are Shallow open waters. They are small bodies of standing or gently flowing water that represent a transitional stage between lakes and marshes. They vary greatly in physical and chemical composition. Its surface is free of vegetation except for aquatic macrophytes. Unlike lakes, the water temperature in shallow open waters is uniform, without any stratification. Shallow open waters are usually connected to sources of groundwater and receive additional inputs from runoff, precipitation and other water bodies. Their depth is usually less than 2meters. Shallow open waters are characteristic of intermittently flooded, permanently flooded or seasonally stable water regimes. They may dry out due to water losses from seepage or evaporation (Foote Lee *et al*. 1996). Wetlands are one of the most threatened habitats of the world. Wetlands in India, as elsewhere are increasingly facing several anthropogenic pressures. Thus, the rapidly expanding human population, large scale changes in

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Drought Vulnerability Detection and Mapping in Attapadi, A Part of Southern Western Ghats, India- Using Geoinformation Science and Technology

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Abstract: ***Drought is an insidious hazard of nature which is considered by many to be the most complex but least understood of all natural hazards. It is among the natural disaster that causes damages and affects many people's life in many part of the world. Drought can be divided into four categories of meteorological, hydrological, agricultural and social-economic. Drought vulnerability is a concept which shows the likelihood of damages from hazard in a particular place by focusing on the system status prior to the disaster. Drought vulnerability has been viewed as a potential for losses in the region due to water deficiency at the time of drought. In this study the vulnerability of drought in Attapadi province in Palakkad district is investigated by providing vulnerability maps which demonstrates spatial characteristics of drought vulnerability.Modern technology has made substantial contribution in the identification of drought vulnerable area. The modern technology used in present system for drought prone area identification is remote sensing and geographic information system. Drought is one of the climatic, natural disasters, having an impact on both the economy and the society, with its long-standing problems. Drought by nature is a result of inter-related parameters. The study is based on the concept that the severity of the drought is a function of rainfall, hydrological and physical aspects of the landscape, leading to meteorological, hydrological and physical drought. In the present study a Geographic Information Systems (GIS) and remote sensing -based tool for drought vulnerability assessment at a micro level has been developed. The result of this study can be used for preparedness planning and for allocating resources for facing droughts in this region.***

Keywords: Drought, Geographic Information System, Remote Sensing, Attapadi, Vulnerability Maps

1. Introduction

Drought is considered by many to be the most complex but least understood of all natural hazards, affecting more people than any other hazard (Abdel Aziz Belal ,2014). Drought risk is a product of a region's exposure to the natural hazard and its vulnerability to extended periods of water shortage (Nishadi,2015). Drought is a period of abnormally dry weather sufficiently for the lack of precipitation to cause a serious hydrological imbalance and carries connotations of a moisture deficiency with respect to man's usage of water. GIS is an information system that is designed to work with data referenced by spatial or geographic coordinates. GIS combined with MCE (Multi-Criteria Evaluation) can achieve measurable evaluation of drought risk. Karamouz *et al,* 2015, introduced Technologies for evaluating agriculture meteorological drought risk with GIS-MCE. The results indicated that technology of GIS-MCE can combine multiple source information associating with agriculture meteorological drought risk and achieve measurable result. Satellite remote sensing provides a synoptic view of the land and a spatial context for measuring drought Impacts, which have proved to be a valuable source of spatially continuous data with improved information for monitoring vegetation dynamics. Sierra-Soler *et al,* 2015 used the newly developed LULC methodology to determine the effects of drought in specific classes with great precision.

According to Jerrod *et al,* 2016, Earth observation satellites could prove useful for the assessment and evaluation of drought effects in forest ecosystems. The objective of his study were to briefly review the existing sources of remote sensing data and their potential to detect drought damage; to review the remote sensing applications and studies carried out during the last two decades aiming at detecting and quantifying disturbances caused by various stress factors, and especially those causing effects similar to drought. If nations and regions are to make progress in reducing the serious consequences of drought, they must improve their understanding of the hazard and the factors that influence vulnerability. It is critical for drought-prone regions to better understand their drought climatology (i.e., the probability of drought at different levels of intensity and duration) and establish comprehensive and integrated drought information system that incorporate climate, soil, and water supply factors such as precipitation, temperature, soil moisture, snow pack, reservoir and lake levels, ground water levels, and stream flow. All drought prone nations should develop national drought policies and preparedness plans that place emphasis on risk management rather than following the traditional approach of crisis management, where the emphasis is on reactive, emergency response measures. Crisis management decreases self-reliance and increase dependence on government and donors. India is predominantly an agrarian country as more than 70% of its population is dependent on agriculture. Due to the vagaries of rainfall more than 68% of the net sown area in the country is drought prone, out of which 50% is severe in nature. The country experiences drought every 2 to 3 years in one part or other (Jeyaseelan et al., 2001). The nation experienced phenomenal drought condition in the years 1972, 1979 and 1989 (C.S.E, 2001). UNICEF reported that 'an estimated 130 million people – 15 percent of the population – in more than 70,000 villages and 230 urban

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Water Quality Mapping of Coastal Aquifers in Central Part of Penisular India Using Geographic Information System

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Abstract: *The coastal tract of central Kerala, India comprises of Tertiary sediments and the phreatic aquifer here acts as an important source of drinking water. The most important climatic feature in the region is the monsoon, which has great influence on the quality of the groundwater. Water samples were collected during pre-monsoon and post-monsoon seasons from open wells and quality analyses including bacteriological studies were carried out. Groundwater quality maps were prepared based on GIS. The groundwater quality classification maps of the study area reflect the areal extent of each zone accurately and the variations in each parameter. Application of GIS further helped in delineating the potential potable groundwater zones of the area. The study revealed the inferior quality of groundwater in most of the coastal belt and also prevalence of E. coli in drinking water.*

Keywords: *coastal aquifer, groundwater quality, GIS*

I. Introduction

Groundwater is one of the most important natural resources necessary for humanity. It is vital for the existence of mankind but faces acute shortage. Groundwater is that invisible supply of water that seeps beneath the surface of the ground, collects in natural underground reservoirs known as aquifers, and is the source of water in springs and wells. It provides almost a third of all freshwater on earth. It is threatened, however, by pollution, water mismanagement and exploding populations just as the world's remaining sources of freshwater are endangered. Groundwater resources are dynamic in nature as they grow with the expansion of irrigation activities, industrialization, urbanization etc. As it is the largest available source of fresh water lying beneath the ground it has become crucial not only for targeting of groundwater potential zones, but also monitoring and conserving this important resource. The expenditure and labour incurred in developing surface water is much more compared to groundwater, hence more emphasis is placed on the utilization of groundwater, which can be developed within a short time. Besides targeting groundwater potential zones it is also important to identify suitable sites for artificial recharge usage cycle. When the recharge rate cannot meet the demand for water, the balance is disturbed and hence calls for artificial recharge on a country wise basis (Sameena et. al. 2000). With the world's population explosion, increasing pollution and wide-scale mismanagement of freshwater supplies, a critical water shortage may occur within the next 50 years and hence counter-measures are essential. The slow penetration of pollutants has been called a "chemical time bomb." It threatens humankind. Another danger is that of saltwater intrusion: the displacement of fresh water in coastal aquifers by seawater. The problem is acute in some coastal regions and for small islands. India with its long coastline also faces this problem. Another important aspect is water quality. Improvements in existing strategies and the innovation of new techniques resting on a strong science and technology base will be needed to eliminate the pollution of surface and ground water resources, to improve water quality and to step up the recycling and re-use of water. Science and technology and training have also important roles to play in water resources development in general. Water is one of the most crucial elements in developmental planning. As the country prepares itself to enter the 21st century, efforts to develop, conserve, utilize and manage this important resource have to be guided by national perspectives.

The problems faced by the coastal zone of Kerala, where the present study area falls, are unique among all other states of India m mainly due to its high density of population and peculiar geological setting. The hydrogeological environment along this 560 km long coast with its backwater, lagoons, estuaries and barrier islands is complex in nature. The groundwater development along the coast has been increased many fold during the last four decades to meet the increase in requirements as a result of population growth, industrial development and change in lifestyle.

GIS is an effective tool for the integration of various data and hence has multifarious uses in geological studies. The GIS offers unique opportunities to integrate spatial data from different sources with the natural resources management models (Goodchild, 1993). GIS has been put to effective use in delineating groundwater potential zones in many earlier studies, Saraf and Choudhary,(1998); Sarkar et al., (2001); Khan and Moharana, (2002); Srinivasa et al., (2004). Application of GIS for groundwater resource assessment has also been reported

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Temporal Change Assessment of Oxbow Lakes in Kerala, India Using Geographic Information System

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Abstract: ***It is increasingly realized that the planet earth is facing grave environmental problems with fast depleting natural resources and threatening the very existence of most of the ecosystems. Serious concerns are voiced among scientists, planners, sociologists, politicians, and economists to conserve and preserve the natural resources of the world. 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. Oxbow lakes are Shallow open waters. They are small bodies of standing or gently flowing water that represent a transitional stage between lakes and marshes. "Kanichan thura" at Vynthala is considered to be the only one naturally formed "Ox-bow" lake in Kerala. The need to monitor land cover is derived from multiple intersecting drivers, including the physical climate, ecosystem health, and societal needs. Tropical ecosystem has undergone rapid land cover changes especially in the last few decades. Land use and land cover are dynamic Land use/ Land cover changes also involve the modification, either direct or indirect, of natural habitats and their impact on the ecology of the area. The land-cover changes occur naturally in a progressive and gradual way, however sometimes it may be rapid and abrupt due to anthropogenic activities. Land use/cover change has become a central component in current strategies for managing natural resource and monitoring environmental changes. Present study analyses the change in oxbow lake due to natural and anthropogenic reasons. A good portion of this Oxbow lake- like structure has been either encroached upon or degraded. A small portion remains undamaged.***

Keywords: Oxbow lake, GIS, Kanichamthura, natural resource

1. Introduction

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. It also includes changes in intensity and management (Verburg, et al, 2000). Information about land use change is necessary to update land cover maps and for effective management and planning of the resources for sustainable development (Alphan 2003). 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. Over the years, remote sensing has been used for land use/land cover mapping in different parts of India (Gautam and Narayanan, 1983: Brahabhatt *et al.*, 2000). Accurate and up-to-date land cover change information is necessary to understand and assess the environmental consequences of such changes.

Vegetation mapping is a product of the development of remote sensing, initially through aerial photography, remote sensing technology, because of the benefits it offers wide area coverage, frequent revisits, multispectral, multisource, and storage in digital format to facilitate subsequent updating and compatibility with GIS technology proved very practical and economical means for an accurate classification of land cover (Lillesand and Kiefer, 1999). A large number of plants and animals are inhabited in this oxbow lake. It is biodiversity Sanctuaries especially in the dry seasons. During the drought period, these ponds are refugee for almost all the fresh water organism. These local biodiversity hotspots are ideal for detailed biological investigations. . They are cradles of biological diversity, providing the water and primary productivity upon which countless species of plants and animals depend for survival. Many of these plants and animals have specially adapted to living in wet places

The floral diversity of this oxbow lake is very significant. Freshwaters support a large diversity of biota representing almost all taxonomic groups. Macrophytes Dominate in the lake. .Large number of rare and endangered species of plants are inhabited in kanichamthura oxbow lake. Variety of medicinal plants, which are rare endangered inhabited in oxbow. Wide verities of trees are present along the banks of the lake. The present analysis of land use and land cover change involves a quantitative estimation of land use and also reveals the periodic change that occurs in the oxbow vegetation in the area and its extent in detail. "Kanichan thura" at Vynthala is considered to be the only one naturally formed "Ox-bow" lake in Kerala,

2. Materials and Methods

Four suitable cloud-free images were available for this study, spanning the period from 1973 to the 2014. A Landsat Multi Spectral Scanner (MSS) image dated 20th March, 1973 was downloaded from the Global Land Cover Facility site hosted by the University of Maryland (http://glcfapp.umiacs.umd.edu). IRS-1C Linear Imaging Self Scanner (LISS)-III satellite data of 19 March 2014 covering path and row 101/68 was obtained from the National Remote Sensing Agency, Hyderabad. LANDSAT-MSS data with a spatial resolution of 80 m and spectral bands (B1 0.5–0.6, B2 0.6–0.7, B3 0.7–0.8, and B4 0.8– 1.1

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LANDSLIDE SUCEPTIBILITY ANALYSIS OF KOTHAMANGALAM-MUNNAR HIGHWAY USING GEOINFOEMATICS

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ABSTRACT

Landslides occur in a large variety of forms depending on the type and speed of movements, the material involved and the triggering mechanism. The research area comprises an area of 77 km road stretch Kothamangalam-Munnar highway (NH49) of Kerala and it was situated at in two districts Idukki and Ernakulam. The present study tries to identify different landslide prone areas in Kothamangalam-Munnar highway (NH49) of Kerala by using Remote Sensing and GIS. In the present study raster based weightage method was carried out for the preparation of landslide susceptibility zonation map. For the study data utilized include survey of India Topographic maps, Indian Remote Sensing Satellite data and Rainfall data from the Indian Meteorological Department. In this study a set of 6 instability factors corresponding to the causative factors for the instability were prepared using remote sensing information and topographic sheets. Different thematic layers such as slope, aspect, elevation, drainage density, landuse and rainfall were created for the preparation of landslide susceptibility zonation map. The accuracy of landslide prediction map was verified by field investigation using GPS.

Key words: Landslide, Geographic Information System, Remote Sensing, Disaster, Prediction

INTRODUCTION

Natural disasters such as landslides, earthquakes, flood, drought, cyclone, volcanic eruptions, environmental degradation etc are of global phenomenon. Most of the countries are experiencing either one or more disasters at regular interval. International Decade for Natural Disaster

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Measurement of Dielectric Constant of Waxes at Different Temperatures using Split Ring Resonator Structure

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***Abstract*—Dielectric constant variation with temperature for different wax samples is analysed with the help of split ring resonators (SRRs). The method employs a simple extraction procedure to obtain the unknown permittivity values from a calibration curve drawn between relative permittivity of standard samples and resonant frequency of SRR with each of the samples placed above it. The wax sample is placed on the SRR surface and its transmission characteristics are analysed using a vector network analyser (VNA) with its transmitting and receiving probes placed on either side of the SRR - sample system. The temperature is gradually increased from room temperature to 60°C with the help of a hot metal plate placed near the SRR. The dielectric constant of wax sample in contact with the SRR surface varies with the temperature, which in turn changes the capacitance of the SRR, resulting in a shift in its resonant frequency. The method has its advantages like simple experimental setup, direct measurement and ease of sample preparation.**

I. Introduction

Several industrial and household applications like lubricants, cosmetics, candles etc. utilizes the diverse properties of waxes. Like all dielectrics, structural and electrical properties of waxes are dependent upon temperature. There are several techniques existing for measurement of relative permittivity of dielectric samples at higher temperatures. Some of them are circular cavity method, open ended coaxial probe method and circular waveguide method. A broadband microwave system is presented by Li *et. al.*, that measure dielectric properties of low-loss materials at high temperatures using circular cavity method [1]. An open ended coaxial probe method for glass ceramic and porous alumina are done by Gershon *et. al* [2]. Measurement techniques using coaxial lines, wave guides and cavity perturbations are explained in the literature [3]. Many of these methods demand bulky experimental setup and detailed calculations.

Factors contributing to the temperature dependence of dielectric constants of materials are analysed by E. Havinga using some alkali halides and $BaTiO_3$ as samples [4]. Analysis of variations in dielectric constant with temperature of the material shellac is done by Srivastava *et. al.* [5]. A study on electric properties such as dielectric constant and dielectric loss is conducted in the p-band microwave frequencies for the solid samples of bees wax, paraffin wax and microcrystalline wax using Von Hippel method at room temperatures [6]. The analysis in the above referred work is done for wax samples after heat treatment also. But a detailed study on permittivity variation of wax samples under continuous variation of temperature is not found in the literature. In this paper we present the study of temperature dependence of dielectric constant of three wax samples (bees wax, bran wax and paraffin wax) by using split ring resonator (SRR).

Fig. 1. Schematic representation of the Split Ring Resonator (SRR) with its structural parameters - inner radius (r), ring width (c) and spacing (d)

SRRs are artificial constituent molecules of metamaterials showing negative permeability and having a LC resonant nature. The sensitive nature of the resonant frequency of SRR arising due to small changes in the permittivity of the medium in contact with it is studied in some of the previous works [7]–[9]. When a dielectric sample is placed on the surface of SRR the resonant frequency gets redshifted due to an increase in the capacitance of the resonator. Fig. 1 shows the structural representation of SRR with its structural parameters - inner radius (r), ring width (c) and spacing (d) and the resonant frequency is given by

$$f = \frac{1}{2\pi\sqrt{LC_{(\epsilon_r)}}} \tag{1}$$

where L is the inductance and C is the capacitance of the resonator which is a function of relative permittivity (ϵ_r) of the sample.

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Spectral Domain Modeling of the Effect of Film Purity for Superconducting Slotline

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***Abstract*—A computation technique is presented to analyse the electromagnetic response of High Temperature Superconducting (HTS) film purity using a slotline. The complex conductivity of HTS films for three different material purity is modeled using Coffey-Clem (CC) unified theory. By using the surface impedance calculated by CC model, the dyadic Green's functions in Spectral Domain Method (SDM) are formulated for the slotline. The Galerkin's procedure is employed for the computation of the propagation parameters when HTS slotlines of different purities are guiding a fixed frequency microwave signal. Changes in the propagation parameters are analyzed for the variation of the film thickness at different working temperatures. The paper presents a modeling method for studying the microwave response of the HTS film purity.**

***Index Terms*—Electromagnetic propagation, Green's function methods, Transmission lines, High Temperature Superconductors.**

I. Introduction

The High Temperature Superconducting (HTS) films of different purity are manufactured using various techniques and are reported in the literature [1], [2]. Material purity of the HTS film used as the thin strip on inhomogeneous transmission lines significantly changes the complex conductivity and the propagation parameters [3]. Based on the experimental data regarding purity, YBCO thin films can be broadly classified into three types [3]. The high purity films, the medium purity films, and the low purity films are differentiated based on the phenomenological description of complex penetration depth. In this paper we present a modeling methodology to study the relationship between HTS film purity with electromagnetic wave propagation using a slotline for a wide range of temperature and strip thickness.

The modeling of HTS transmission lines without considering the vortex effects when no dc magnetic field is applied may appear straight forward [3]. But HTS films like YBCO are extreme type II materials and they will be in mixed state even at very low magnetic field values [4]. The microwave signal itself may make them in vortex state. At liquid nitrogen temperatures, the HTS films will have significant vortex activities like flux creep and flux flow [5]. For the accurate computation of conductivity of the HTS films and the propagation parameters of the slotline we need to employ a theory which takes into account the fields due to microwave signal, applied dc field and vortex generated fields [5]–[7]. Accordingly, the modeling of inhomogeneous HTS transmission lines are quite challenging. Again, the inhomogeneous structure of striplines make their field derivations and formulation of dyadic Green's functions mathematically complicated [8]–[13]. The HTS contribution of the slotline have to be properly incorporated into the dyadic Green's functions for making the HTS film purity analysis accurate [14].

The HTS microstrip line, resonator, slotline and Coplanar waveguide have been modeled and their propagation parameters have been analyzed in our earlier works [9], [10], [12]–[15]. In this work we study the impact of HTS film purity on the microwave signal propagation by incorporating flux dynamics which include creep effect, flux flow phenomenon and vortex pinning and present a computation technique to specifically analyse this film purity effect on the wave propagation. We take a slotline with HTS material of varying film purity on a substrate like sapphire and place it in an applied dc magnetic field. For the sake of simplicity, we neglect the anisotropic natures of the permittivity of the substrate and the conductivity of the HTS material.

II. Modeling Technique

In Spectral Domain Method (SDM), by matching the electromagnetic boundary conditions of the different interfaces of the slotline, we obtain the fourier transformed coupled equation as $[\tilde{\mathbf{Y}}][\tilde{\mathbf{E}}] = [\tilde{\mathbf{J}}]$ where $\tilde{Y}$'s are the admittance elements, $\tilde{E}$'s are the unknown electric fields and $\tilde{J}$'s are the strip currents. The detailed discussion of the method is available elsewhere [8]. To incorporate the HTS contribution, we expand the unknown electric field as $\tilde{E} = \tilde{E}^{e} + Z_s \tilde{J}$ where $\tilde{E}^{e}$ is the Electric field distribution at the interface excluding the region of the strip, Z_s is the surface impedance due to HTS material and $\tilde{J}$ represent the strip current. Accordingly, our algebraic equation will be modified as $[\tilde{\mathbf{Y}}'][\tilde{\mathbf{E}}] = [\tilde{\mathbf{J}}]$ where $\tilde{Y}'$'s are the modified admittance Green's functions [10]. The propagation parameters are computed using Galerkin procedure.

The Coffey-Clem (CC) model gives a self-consistently determined penetration depth $\tilde{\lambda}(\omega, B, T)$ in terms of field dependent penetration depth λ, normal fluid skin depth δ_{nf} and the complex effective skin depth $\tilde{\delta}_{\mathrm{vc}}$ [5] as

$$\tilde{\lambda}(\omega, B, T) = \left(\frac{\lambda^2 - (\mathrm{i}/2)\tilde{\delta}_{\mathrm{vc}}^2}{1 + 2\mathrm{i}\lambda^2 \delta_{\mathrm{nf}}^{-2}} \right)^{1/2} \quad (1)$$

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FDTD Analysis of the Interaction of a Gaussian Pulse with Negative Permittivity Metamaterial Slab

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***Abstract*—The interaction of a Gaussian pulse with a negative permittivity metamaterial slab is presented. The results of this numerical study predict the propagation behavior of electromagnetic wave in presence of the slab. To perform this analysis the Auxiliary Differential Equation Finite Difference Time Domain (ADE-FDTD) analysis for a dispersive medium using Drude model is used. The negative permittivity plasma medium is modeled using effective medium theory. A Gaussian pulse of wide frequency bandwidth is used for the analysis. The field distributions for frequencies above and below the plasma frequency are investigated. The study reveals the frequency selective properties of the negative permittivity slab in relation to the reflection and transmission characteristics.**

***Index Terms*—Dispersive medium, Drude model, FDTD, Gaussian pulse, Metamaterials, Negative Permittivity.**

I. Introduction

Metamaterials are engineered periodic structures having homogeneous properties for the interacting waves. These materials show unusual electromagnetic properties not observed with normal materials. The unusual behaviors of these materials are due to its negative values of permeability μ, permittivity ϵ and index of refraction n. Periodic structures having negative μ and ϵ are mixed together to get negative n structure [1]–[4]. Finite Difference Time Domain (FDTD) method offers a simple and straight forward way for modeling complicated periodic structures [5]–[9] like metamaterial and photonic band-gap structures. Since these artificial plasma media consists of periodic distribution of conducting elements, it is dispersive [10]–[13]. There are two possibilities for the modeling of this medium in FDTD. One is the actual insertion of conducting elements periodically in the computational domain by assigning high electron density for the selected cells and the other is by considering the medium in terms of effective medium properties. Mainly three methods are used for the analysis of a dispersive medium using FDTD [5]. They are Auxiliary differential Equation method (ADE), Recursive Convolution method (RC), and the Z-transform method.

The electromagnetic wave propagation in presence of a negative permittivity slab using effective medium theory is preformed in this study. A Gaussian pulse of wide frequency bandwidth is used to illuminate the computational domain. The signal strengths in front and back of the negative permittivity slab for different frequencies are analyzed.

II. Formulation of the Problem

The problem is simulated in 2-dimensional dispersive FDTD space using effective medium theory. The model equations involved in 2D-ADE-FDTD are used. In this study Drude model is used for modeling frequency dependent permittivity slab. According to this model, the relative permittivity $\epsilon_r(\omega)$ and relative permeability $\mu_r(\omega)$ are as follows,

$$\epsilon_r(\omega) = 1 - \frac{\omega_{ep}^2}{\omega^2 - \omega_{e0}^2 - i\gamma_e\omega} \tag{1}$$

$$\mu_r(\omega) = 1 - \frac{\omega_{mp}^2}{\omega^2 - \omega_{m0}^2 - i\gamma_m\omega} \tag{2}$$

where ω_{ep} is the electric plasma frequency and ω_{e0} is the low frequency edge of the electric forbidden band. γ_e is the electric damping factor. ω_{mp}, ω_{m0} and γ_m are the corresponding factors for the magnetic field. For a TE wave with field components E_z, H_x and H_y, Maxwells curl equations in component form are given by,

$$\frac{\partial D_z}{\partial t} = \frac{\partial H_y}{\partial x} - \frac{\partial H_x}{\partial y} \tag{3}$$

$$\frac{\partial B_x}{\partial t} = -\frac{\partial E_z}{\partial y} \tag{4}$$

and

$$\frac{\partial B_y}{\partial t} = \frac{\partial E_z}{\partial x} \tag{5}$$

The expressions for D and B in terms of the components of electric and magnetic fields E_z, H_x and H_y can be found out using Maxwells equations and Drude model as [7],

$$D_z = \epsilon_0(1 - \frac{\omega_{ep}^2}{\omega^2 - \omega_{e0}^2 - i\gamma_e\omega})E_z \tag{6}$$

$$B_x = \mu_0(1 - \frac{\omega_{mp}^2}{\omega^2 - \omega_{m0}^2 - i\gamma_m\omega})H_x \tag{7}$$

$$B_y = \mu_0(1 - \frac{\omega_{mp}^2}{\omega^2 - \omega_{m0}^2 - i\gamma_m\omega})H_y \tag{8}$$

Equations used for modeling of metamaterials are obtained by simplifying and converting to time domain by replacing $i\omega$ by $\partial/\partial t$ and applying the second order FDTD discretization to the Eqn. 6 - Eqn. 8.

The computational domain is divided into three regions and a negative permittivity slab of thickness d is defined in it as

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On the type species of the genus *Aetius* O. Pickard-Cambridge, 1896: The first description of male with notes on cymbial notch and mating plug (Araneae: Corinnidae: Castianeirinae)

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The rare ant mimicking sac spider genus *Aetius* was erected by O. Pickard-Cambridge in 1896 based on an unspecified number of female specimen(s) collected from Sri Lanka. The type species of the genus, *A. decollatus* O. Pickard-Cambridge, 1896, has been redescribed twice based on the holotype (Majumder & Tikader 1991; Deeleman-Reinhold 2001). Reimoser (1934) recorded the genus for the first time from India, who collected a male specimen from Mudumalai Tiger Reserve in Tamil Nadu State of southern India. This specimen was identified as *A. decollatus*, but it was never formally described and was later recognised to be a penultimate male (Dankittipakul & Singtripop 2013). Deeleman-Reinhold (2001) described the second representative of the genus, *A. nocturnus*, based on a single female specimen from Borneo, 105 years after the establishment of the genus. Dankittipakul & Singtripop (2013) described the male of *A. nocturnus*, thereby revealing the male genitalia of the genus, but the type species was still known only from the female sex.

This paper provides the first description of the hitherto unknown male of A. *decollatus* and redescribes the female based on freshly collected materials from the Wayanad Wildlife Sanctuary in the Kerala State, which is part of the Western Ghats of India, and the agricultural plains of Pollachi in the Tamil Nadu State of India. The proposed function and significance of the semi-circular cymbial notch of the male palp, which is unique to the males of *Aetius* spp. (Dankittipakul & Singtripop 2013), is discussed. The occurrence of mating plugs in the genus and variations in body pattern are reported. Additionally, the current distribution of *A. decollatus* is mapped.

Fresh material was collected directly by hand. All measurements are in millimetres (mm). Length of palp and leg segments are as follows: total (femur, patella, tibia, metatarsus (except palp), and tarsus). Description and terminology follow Reiskind (1969) and Raven (2015), and spine positions follow the format of Bosselaers & Jocqué (2000). The following morphological indices are also recorded: carapace index = carapace width/carapace length x 100, sternum index = sternum width/sternum length x 100, abdominal index = abdominal width/abdominal length x 100, dorsal sclerite index = dorsal sclerite width/dorsal sclerite length x 100. Drawings were made by the aid of a drawing tube attached to the microscope. The micro photographic images were taken with Olympus EPL-3 digital camera attached to a Magnus MSZ TR stereo microscope; the photographs were stacked using Combine ZP software (www.hadleyweb.pwp.blueyonder.co.uk) to create a final image. The specimens are deposited in a reference collection housed at the Centre for Animal Taxonomy and Ecology, Department of Zoology, Christ College, Irinjalakuda, Kerala (CATE).

Abbreviations used in the text: AER—anterior eye row, ALE—anterior lateral eye, AME—anterior median eye, do—dorsal, MOQ—median ocular quadrangle, OUMNH—Oxford University Museum of Natural History, pl—prolateral, PER—posterior eye row, PLE—posterior lateral eye, PME—posterior median eye, rl—retrolateral, rlv—retrolateral ventral, vt—ventral.

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Section A: Environmental Science

Research Article

Urban Green Space Analysis and Change Detection Using Geoinformatics

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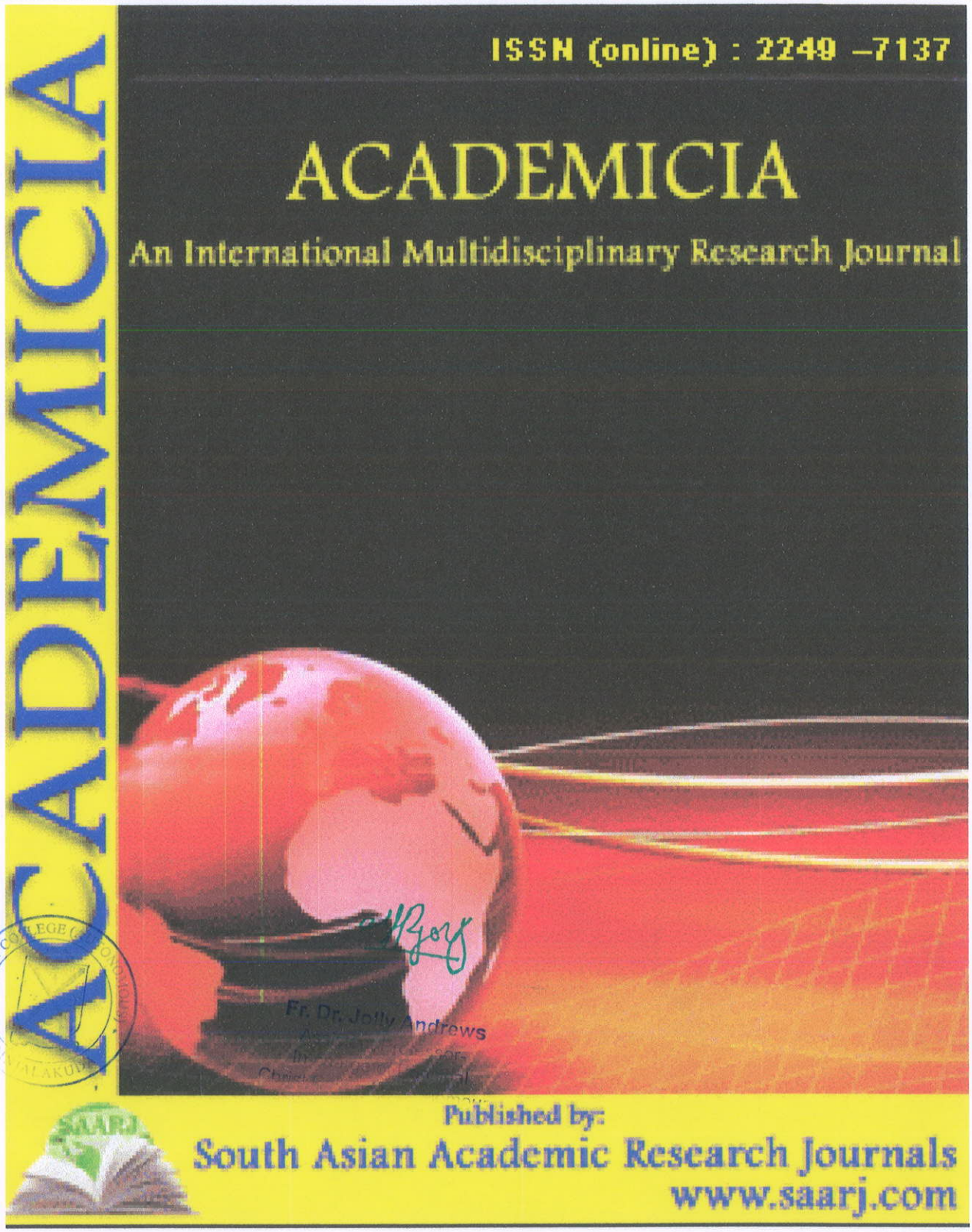
Abstract: Green areas are vital in determining the quality of urban environment as they influence physical health of citizens and for instance, some are also used as recreational areas. In the process of land use planning for almost all cities, allocation of urban land to green space has become an important policy issue. More specifically, urban green spaces as a class of land use is defined as places within the extent of an urban area that provide opportunities for outdoor recreation and enjoyment or simply pockets of vegetation in the city environment. Mapping and monitoring of urban green spaces is a prerequisite for effective management and protection of urban environment. Change detection is a technique used in GIS and Remote sensing techniques Landsat ETM-7 and OLI - 8 images used for change detecting Supervised maximum likely hood classification LU/LC which have may occur between a time interval (2000 to 2015) in Thrissur corporation The LU/LC of both years has been delineated using and classified maps were crossed to generate an urban green cover changes Normalized difference vegetation index (NDV1) has been employed for detection of change area and quantification of the amount of decline or increase in urban greenery 2000-2015 The analysis showers an overall decrease in the total green space of the study area from 54 2% (2010) to 48.1% (2015). The land use analysis showed that there is a substantial increase in built up and other non-green areas Zonal wise analysis was also carried out to know delineate the most effected localities in terms of green space conversion as a part of development.

Key words: Remote sensing, Green areas, Thrissur, Normalized difference vegetation index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THE VALUE OF OSL IN DISTINGUISHING ANCIENT FROM MORE RECENT STRUCTURES IN AN ARCHAEOLOGICAL LANDSCAPE

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ABSTRACT

OSL dating of a stone built structure directly on the south of the Geometric period settlement of Zagora (Andros island, Aegean sea, Greece) was conducted to determine whether a minor access point to the site was ancient. Double single aliquot regeneration (SAR) protocol was recorded for total dose De calculation, in which samples were first stimulated with IR and the post IR blue light stimulated luminescence (BLSL) signal from quartz grains, at 220°C preheat temperature and OSL signal recorded during 40s blue light stimulation. Alpha counting, XRD, XRF were used for radioisotope content and mineralogy assessment. The construction was found to date to the 19th century CE.

KEYWORDS: archaeology, total dose, dose rate, geometric period, OSL

Paleoclimatic Registers from Semi-arid Costal Sediments of Southeastern India: A Multi Proxy Approach

Anburaj Vidyasakar, Helena Sant'Ovaia, Linto Alappat, P. Morthekai, Seshachalam Srinivasalu, A.K. Singhvi, Ferreira Jorge and Celeste Gomes

Abstract The red sand dunes appear along the south east, -west coast of Tamil Nadu, India between the latitudes and longitudes of 8°07′56″N to 8°22′11″N; 77° 19′84″E to 77°53′40″E. The dune sands from this region were studied through magnetic methods such as magnetic susceptibility measurements and acquisition of isothermal remanent magnetization, geochemistry and X-ray diffraction methods. Optically stimulated luminescence (OSL) dating method was used to constrain the chronology of deposits. Three sections were excavated up to 5–9.5 m with one inland deposit (TPV) and two near coastal sections (THOP and MUT).

Celeste Gomes—deceased

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Article

Chronology and weathering history of red dunes (Teri Sands) in the southwest coast of Tamil Nadu, India

Linto Alappat[1,4], Sabu Joseph[2], Sumiko Tsukamoto[4], Stephan Kaufhold[3] & Manfred Frechen[4*]

Alappat, L., Joseph, S., Tsukamoto, S., Kaufhold, S. & Frechen, M. (2016): Chronology and weathering history of red dunes (Teri Sands) in the southwest coast of Tamil Nadu, India. – Z. Dt. Ges. Geowiss., 168: 183–198, Stuttgart.

Abstract: Red dune sands in the southwest coast of Tamil Nadu, India, were examined to understand its chronology of formation using OSL chronometry. Degrees of weathering of these sands were deduced from field observation, clay mineral composition and geochemistry of the bulk sample. The sands were found to have been deposited in two episodes, i.e. between 16–9 ka and at 4.5 ka in the middle and lower parts of the dune field. The late Pleistocene deposition of sand in the upper terrace was associated with abundant sand supply owing to the lower sea level. The second stage of dune accretion at 4.5 ka was observed at the lower level relative to the present day coast. It was presumably associated with late Holocene higher sea level in the coasts of south India and deposition of sand in the backshore region on top of the previous indurated aeolian deposits. The elevated topography of the area acted as an obstruction to trap the sand-laden onshore winds and facilitated accumulation. Spatio-temporal variation in sand accretion was observed in terrace I at the central part of the dunes. The geochemistry and mineralogy of the sands is controlled by initial aeolian sediment sorting and chemical weathering leading to the alteration of feldspars to kaolinite and associated compositional variations in the major elements. The red colour in the sands is found to be related to the concentration of hematite in the fine fraction.

Keywords: OSL dating, chemical index of alteration, red dunes, chemical weathering, Pleistocene, Holocene

1. Introduction

The red dunes with its distinct colour and apparent similarity with red beds observed in the geological strata (Bensing et al. 2005) has attracted the interest of many researchers (Folk 1976, Gardner & Pye 1981, Norris 1969, Pye & Tsoar 2009, Walker 1979). Red dunes occur along the coastal belts typically in the low to mid-latitude areas of the world (Nageswara Rao et al. 2006, Roskin et al. 2011, 2012, Singhvi et al. 1986, Zheng & Wei 1998, Zhang et al. 2008). Sand mobilisation in these coastal areas is largely controlled by variation in the regional climate (mainly wind and precipitation), sand availability and sea level (Kocurek 1998). The reddening may occur post-depositional (e.g. Berner 1969, Gardner & Pye 1981) or may be due to the presence of red detrital sand and clay (e.g. Bensing et al. 2005, Besler 2008). There were several questions raised by earlier workers such as nature and climatic conditions favourable for the formation of red sands and the role of time in the reddening process (e.g. Gardner & Pye 1981 and references therein). Redness index had also been used as an indicator of relative age of its formation (Norris 1969, Turner 1980, Walker 1979). However, Roskin et al. (2012) have shown the insensitivity of colour of this aeolian formation to age. One of the major factors behind the dune reddening is weathering of heavy minerals and/or progressive loss of ferromagnesian minerals present in the sand (Gardner 1981, Van Houten 1961, 1964) under the influence of precipitation and temperature (Folk 1976, Gardner & Pye 1981, Pye & Tsoar 2009).

Red dune sands in the southeast coast of India (Fig. 1A) have been studied for its colour (Gardner 1981, Gardner & Pye 1981), sedimentology and geochemistry (Joseph et al. 1997, 1999, 2002), palaeoclimate and archaeology (Gardner & Martingell 1990, Joseph & Thrivikramji 2005, Jayangondaperumal et al. 2012, Thrivikramji et al. 2008) and for its economic significance (Chandrasekharan & Murugan 2001). However, the chronologies of these sand dunes are largely unknown. Except for few attempts by Jayagondaperumal et al. (2012) and Alappat et al. (2013) using luminescence dating, the majority of studies have relied on the limited radiocarbon

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A TRIANGULAR FUZZY DEA MODEL FOR EFFICIENCY EVALUATION

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Abstract: Data envelopment analysis is a widely used non-parametric technique to measure and evaluate the relative efficiency of similar decision making units. Classical DEA models evaluate the efficiency from input and output values which are precise or crisp in nature. But when it is applied in real life situations input and output values vary even over small intervals of time. Hence mostly the data will be imprecise or fluctuating, which can very well be modelled by fuzzy set theory. So in this paper a DEA model is developed which can handle input output values which are fuzzy in nature. The fuzzy DEA model is developed as a fully fuzzy fractional programming problem and a methodology is suggested for solving it.

AMS Subject Classification: 90C32, 90C70
Key Words: data envelopment analysis, triangular fuzzy numbers, fractional programming

1. Introduction

Data envelopment analysis (DEA) is a linear programming based non-parametric

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MODULAR AND HOMOMORPHIC PRODUCTS ON INTERVAL - VALUED INTUITIONISTIC FUZZY GRAPHS

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Abstract

In this paper, Modular product and homomorphic product on intervalvalued intuitionistic fuzzy graphs has been introduced and degree of vertices of of these new product graphs are determined. Some results involving these products are stated and proved.

AMS Subject Classification:05C72

Key Words and Phrases: Interval-valued intuitionistic fuzzy graph, Strong interval - valued intuitionistic fuzzy graph, modular product, homomorphic product, degree of vertices

LETTER

Split ring resonators made of conducting wires for performance enhancement

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Complex permittivity measurement using metamaterial split ring resonators

Sreedevi P. Chakyar, Sikha K. Simon, C. Bindu, Jolly Andrews, and V. P. Joseph

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Transmission line coupled split ring resonator as dielectric thickness sensor

Hazel Thomas, Sreedevi P. Chakyar, Sikha Simon K., Jolly Andrews, and Joseph V. P.

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Metamaterial split ring resonator as a sensitive mechanical vibration sensor

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First record of *Epidius parvati* Benjamin, 2000 (Araneae: Thomisidae) from Pathiramanal Island, India

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Abstract. The thomisid spider *Epidius parvati* Benjamin, 2000, described from Sri Lanka, is newly recorded from India based on the specimens collected from the Pathiramanal Island, Alappuzha District, Kerala State. A short description and illustrations of both male and female are provided.

Key words. Crab spider; distribution; Ramsar site; faunistics

The crab spider family Thomisidae Sundevall, 1833 is one of the largest families within Araneae with 175 genera and 2155 species (WORLD SPIDER CATALOG 2017). In India, this family is composed of 40 genera and 176 species. Among the 175 global thomisid genera, *Epidius*, with *Epidius longipalpis* Thorell, 1877 as the type species (THORELL 1877), is a small Old World genus known from Oriental and African regions. With the addition of five species described by BENJAMIN (2017), the genus is represented by 15 species and one subspecies (WORLD SPIDER CATALOG 2017). Overall, four species of this genus have been recorded from India so far (WORLD SPIDER CATALOG 2017). During our field studies, we were able to collect a *Epidius* species from Pathiramanal Island, a part of Vembanad, a Ramsar site in Alappuzha district, Kerala State, India. This paper documents the first Indian record of *E. parvati* Benjamin, 2000 and maps its global distribution.

Our specimens were preserved in 70% ethanol and studied using a Zeiss Stemi 2000-C stereomicroscope. The epigynum was cleared using 10% KOH in water solution. The digital images were taken by Leica DFC295 digital camera attached to a Leica M205 C stereomicroscope with LAS montage facility. The specimens are deposited in the collection of the Division of Arachnology, Department of Zoology, Sacred Heart College, Thevara, Cochin, Kerala, India (ADSH).

Abbreviations used. CD, copulatory duct; FD, fertilization duct; SP, spermatheca.

Epidius parvati Benjamin, 2000
Figures 1, 2

For detailed description and illustrations, see BENJAMIN (2000).

Material examined. 1♂, 6♀, 8 juveniles, India, Pathiramanal Island (09°37′07.11″ N, 076°23′04.95″ E; 4 m alt.), collected from foliage by hand, 16-ix-2014, 19-xi-2014, 15-i-2015, 26-v-2015 (J.J. Malamel, M.S. Pradeep & J. Paul).

Description. Male. Live specimen greenish yellow with dorsal folium on the abdomen. No tubercles around eyes. Cheliceral promargin with some fringe of hairs and 3 teeth, retromargin with 2 teeth. Leg formula 1243. Legs with well-developed spines and elongated femur and tibia. Proximal margin of tibia with conspicuous strong ventral bristles. Palpal femur, patella and tibia elongated, tibia with 2 or 3 strong spines. Cymbium longer than wide with hairs and a fine setae apically. Ventral tibial apophysis present but not clearly visible. Conductor massive, sickle shaped and apically pointed. Tutaculum absent. Embolus long, strong, sharp and bifurcated in close observation. Bulbus ovoid. Sperm duct long.

Female. Live specimen greenish yellow in colour. Abdomen oval with white spots. Leg formula 1243. Legs reddish brown with fine spines, especially long and strong ones on the venter of the tibiae, metatarsi and tarsi of legs I and II. Tibia of pedipalp with long macrosetae, tarsus densely covered with short hairs. Epigynum with highly sclerotized margin. SP globular. FD long, close to spermatheca, retrolaterally oriented. CD short, upper portion highly sclerotized and upper lip of copulatory opening extends anteriorly.

Diagnosis. *Epidius parvati* is most similar to *E. longipalpis* but differs by the following combination of characters (Figure 2): (1) the sickle shaped, massive and pointed conductor (in *E. longipalpis*, the tip of the conductor wide and rounded); (2) the embolus is bifurcated, strong and sharp when compared to the simple embolus in *E. longipalpis*; (3) the length and shape of the tegular apophysisis also diagnostic in *E. parvati* (BADCOCK 1918; BENJAMIN 2000).

Ecology. Thomisid spiders are best known for their camouflage (OXFORD & GILLESPIE 1998). Live, adult specimens

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RESEARCH PAPERS

BOOK REVIEW

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TIME SERIES DROUGHT VULNERABILITY MAPPING IN PALAKKAD DISTRICT, INDIA- USING GEOINFORMATION SCIENCE AND TECHNOLOGY

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ABSTRACT

Drought is one of the major environmental disasters, which have been occurring in almost all climatic zones and damage to the environment and economies of several countries has been extensive and death toll of livestock unprecedented. Drought damages are more pronounced or prominent in areas where there is a direct threat to livelihoods. The advanced technologies like remote sensing and geographical information system are very essential to identify the drought condition. Remote sensing and geographic information system have significantly aided identification of drought vulnerable areas in the recent past. Drought is one of the natural disasters having an impact on both the economy and the society, with its long-standing problems. Drought by nature is a result of inter-related parameters. The study is based on the concept that the severity of the drought is a function of rainfall, hydrological and physical aspects of the landscape. In the present study a Geographic Information Systems (GIS) and remote sensing based tool for drought vulnerability assessment at a micro level has been developed. Drought vulnerability is a concept which shows the likelihood of damages from hazard in a particular place by focusing on the system status prior to the disaster. Drought vulnerability has been viewed as a potential for losses in the region due to water deficiency at the time of drought. In this study the vulnerability of drought in Palakkad district (2008 to 2018) is investigated by providing vulnerability maps which demonstrates spatial characteristics of drought vulnerability.

Key words: *Drought, Geographic Information System, Remote Sensing, Vulnerability Maps*

INTRODUCTION

Drought is one the climatic as well as natural disasters common all over the world. Droughts have disastrous impact on the economy and can affect the largest segment of the society, which may last for months and in some cases several years (Reza, 2010). Drought is more often like a cancer on the land, mute but sure assaulter that seems to have no marked beginning or ending; a malaise slowly engulfing the community and often leaves just as gradually(Sergio,2007). Drought may be categorized as continuing disasters and as the time passes, the situation may further deteriorate. The continuing disasters include prolonged droughts and crop failure (Vasanthavigar et al, 2011). These continuing disasters or drought affects a very large area. The droughts may compound longstanding problems of deforestation, encroaching desertification, soil erosion, forced migration, malnutrition, epidemics and loss of life over

A STUDY ON WORK-LIFE BALANCE AMONG FEMALE NURSES WITH SPECIAL REFERENCE TO PARIYARAM MEDICAL COLLEGE, KANNUR DISTRICT

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Abstract

The role of working women has changed throughout the world due to economic and social conditions. Th increasing work pressure and responsibilities on the personal on the working women leaving them with less tim for themselves. Work life integrated with personal life also creates stress on individual, family and work relate areas. This affects the person's physical, emotional and social well-being. Thus, achieving work life balance is necessity for working women to have a good quality of life. Working women are flooded with work and famil commitments. Majority of working women are bogged down while trying to balance their work and family lif Health Care Sector is an area of interest because shift work, especially night work, overtime places lot of stress c the nurses both at professional and personal front. Research indicates that improper work scheduling and lon working hours tend to cause adverse effect on employee's health and well-being. The main purpose of the paper to discuss the various factors affecting Work Life balance of women employees in hospital sector.

Key words: Work life balance, quality of life, personal life, family and work related areas

Section I

1.1 Introduction

Indian families are undergoing rapid changes due to the increased pace of urbanization and modernization. India women belonging to all classes have entered into remunerated occupations. At the present, Indian women exposure to educational opportunities is substantially higher than it was some decades ago, especially in the urba setting. This has opened new outlooks, increased awareness and raised aspirations of personal growth. This, alon with economic pressure, has been instrumental in influencing women's decision to enter the work force. Mo studies of employed women in India have reported economic need as being the primary reason given for working

According to 2010 National Health Interview Survey Occupational Health Supplement data, 16% of U.S workers reported difficulty balancing work and family. Imbalance was more prevalent among workers aged 30–4 (19%) compared with other age groups.

Work–life conflict is not gender-specific. According to the Center for American Progress, 90% of workir mothers and 95% of working fathers report work–family conflict. However, because of the social norn surrounding each gender role, and how the organization views its ideal worker, men and women handle the work life balance differently. Organizations play a large part in how their employees deal with work–life balance. Son companies have taken proactive measures in providing programs and initiatives to help their employees cope wi work–life balance. Today there are many young women who do not want to just stay at home and do house wor but want to have careers. About 64% of mothers whose youngest child was under age six, and 77% of mothe

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CONTENTS

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An Exploration on the Tormenting Expressions of Caste System, through the Narratives of Some Dalit women Writers

Dr. Ancy Joseph, M.A., Ph.D.
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Abstract

Dalits are considered as those who hail from low castes and have been marginalised and oppressed in all possible manners. As any other oppressed group, the Dalits too attempt to track their feelings and emotions through the power of words. They utilise the written words as a weapon against the inhuman oppression of Dalits by the Brahminical social order that hinders the basic human rights and dignity. Apart from other stream of literature with the intent for entertainment, Dalit writing attempts to record social injustice by revealing the harsh realities of Dalit life. Dalit women writers choose the medium of autobiography to give life to their emotions and feelings. The writings of Dalit women writers are based on the life experiences and consciousness. Dalit women writers portray their outburst for justice. Through their autobiographies, they express their attitudes towards work which helped them to conquer their enemy and achieve their own identity.

Keywords: Casteism, Dalit literature, quest for equality, marginalisation.

Dalits

Dalits are considered as those who hail from low castes and have been marginalised and oppressed in all possible manners. They belong to the lowest order of Indian society, facing discrimination from all walks of life like education, social and political aspects. They were excluded from social, economic, cultural, civil and political strands. Initially referred as "Shudras", they have been untouchables based on the traditional Indian Brahminical caste

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The Feminine Fury in Shashi Deshpande's Selected Novels

Sruthy P U and Dr. Ancy Joseph

Abstract

In the Indian social context, sexism is immensely powerful and pervasive and it is deeply internalized by both men and women. For centuries Indian traditions, social norms, culture and customs have been leading men to feel that they are superior and different and forcing women to think that they are inferior human beings who are not expected to play any role other than the traditional ones of each being a wife to her husband, a mother to her children and a caretaker of the house. Of course, these ideological institutions have succeeded in creating an image of Indian woman as always smiling and joyful, eager to serve and please and never transgressing the boundaries of femininity defined by the powerful patriarchy.

Traditional Writers and Female Expectations

The traditional writers of India either represented or misrepresented the genuine female expectations and experiences in their works and at the same time used literature as an effective tool for applying pressures of patriarchal expectations and demands on women. Indian women writers who recognized the ideological operations of patriarchy beneath the structure of literature now oppose this attitude through what is described as a 'practice of resistance' in their writings. They make earnest attempts through their writings to reveal the true picture of Indian womanhood which is struggling under political, sociological, psychological, economical, religious and literary oppressions. There are many women writers like Kamala Markandaya, Nayantara Sahgal, Anita Desai, Kamala Das, Namitha Gokhale, Shobha De and Shashi Deshpande who in their fiction protested against the traditions of patriarchal Indian culture. Like other contemporary Indian feminist writers, Shashi Deshpande explores and exposes the prominent patriarchal premises and prejudices embedded in Indian culture and life style.

RESEARCH ARTICLE OPEN ACCESS

Drought Vulnerability Detection And Mapping In Thrissur District, A Part Of Southern Western Ghats, India- Using Geoinformatics

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ABSTRACT
Drought is an insidious phenomenon. Unlike rapid onset disasters, it tightens its grip over time, gradually destroying an area. In most cases, drought can last for many years .The impacts of drought vary from lack of adequate drinking water, loss of vegetation, loss of farmland, loss of livestock and loss of life due to famine or dehydration. Drought can be divided into four categories of meteorological, hydrological, agricultural and socio-economic. In this study the vulnerability of drought in Thrissur district is investigated by providing vulnerability maps which demonstrates spatial characteristics of drought vulnerability. Thrissur is also called as "cultural capital of Kerala", south India. The modern technology used in present system for drought prone area identification is remote sensing and geographic information system. Drought is one of the climatic, natural disasters, having an impact on both the economy and the society, with its long-standing problems. Drought by nature is a result of inter-related parameters. The study is based on the concept that the severity of the drought is a function of rainfall, hydrological and physical aspects of the landscape, leading to meteorological, hydrological and physical drought. In the present study a Geographic Information Systems (GIS) and remote sensing -based tool for drought vulnerability assessment at a micro level has been developed. The result of this study can be used for preparedness planning and for allocating resources for facing droughts in this region.
Key words: Drought, Geographic Information System, Remote Sensing, Vulnerability Maps

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I. INTRODUCTION

Drought is considered by many to be the most complex but least understood of all natural hazards, affecting more people than any other hazard (Abdel Aziz Belal ,2014). Drought risk is a product of a region's exposure to the natural hazard and its vulnerability to extended periods of water shortage (Nishadi,2015). drought is a normal, recurring feature of climate ; it occurs in virtually all climatic regimes. Drought occurs on high as well as low rain fall areas. Drought is a temporary phenomenon, in contrast to aridity, which is a permanent feature of the climatic and is restricted to low rainfall areas. Drought is a phenomenon occurred by reduction in the amount of precipitation over time, usually a season or more in length; other climatic factors are also associated with it in many regions which aggravate the severity of the event. It also related to the timing, effectiveness of the rains. Thus, each drought year is unique in its climatic characteristics and impacts (somya rajawat, 2016). Technology of GIS-MCE can combine multiple source information associating with agriculture meteorological drought risk and achieve measurable result. Satellite remote sensing provides a synoptic view of the land and a spatial context for measuring drought Impacts, which have proved to be a valuable source of spatially continuous data with improved information for monitoring vegetation dynamics(Elham Asrari et al, 2014). GIS is an information system that is designed to work with data referenced by spatial or geographic coordinates. GIS combined with MCE (Multi-Criteria Evaluation) can achieve measurable evaluation of drought risk. Karamouz et al, 2015, introduced Technologies for evaluating agriculture meteorological drought risk with GIS-MCE. The results indicated that technology of GIS-MCE can combine multiple source information associating with agriculture meteorological drought risk and achieve measurable result. Satellite remote sensing provides a synoptic view of the land and a spatial context for measuring drought Impacts, which have proved to be a valuable source of spatially continuous data with improved information for monitoring vegetation dynamics. Ganesh et al, 2018 used the newly developed LULC methodology to determine the effects of drought in specific classes with great precision.

According to Jerrod et al, 2016, Earth observation satellites could prove useful for the

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TIME SERIES DROUGHT HAZARD MAPPING AND WATER QUALITY MODELING AT COMMUNITY LEVEL IN PALAKKAD DISTRICT USING GEOINFORMATICS

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Abstract: **Drought is one of the major environmental disasters, which have been occurring in almost all climatic zones and damage to the environment and economies of several countries has been extensive and death toll of livestock unprecedented. Drought damages are more pronounced or prominent in areas where there is a direct threat to livelihoods. The advanced technologies like remote sensing and geographical information system are very essential to identify the drought condition. Groundwater is regarded to be the most valuable natural resources. The distribution of groundwater is not uniform through the area. Remote Sensing (RS) and Geographical Information System (GIS) techniques have been used to observe and more systematic analyze various groundwater resources and its demarcation. Groundwater resources are contaminated due to industrial and domestic pollution, depletion induced quality deterioration, over pumping etc. The analysis of physico chemical parameters will help to find the overall quality of area. By integration of different physico-chemical parameters into GIS base and comparison according to the defined standards of drinking water quality would help to generate Water Quality Index map of an area which is very useful in determining the groundwater quality status of the area. The present work identified the drought prone area and Water Quality Index map of Palakkad district with the help of field data, remote sensing and GIS data. The result is useful for the drought management and issues associated with water quality and ground water depletion.**

Keywords: **Drought, Geographic Information System, Remote Sensing, Water Quality Index.**

1. INTRODUCTION

Water causes controversial problems in many parts of the world. Too much of water causes flood and too little causes drought, too poor causes famine, poor quality causes health hazards and poor management creates competition and conflicts (Vijith,2007). Out of the weather related disasters, drought is the most complex one and both the causes and multifaceted are not well understood. Drought is a dangerous natural hazard which is normal to all climate regions (World Meteorological Organization, 1975). It should not be viewed as merely a physical phenomenon rather; drought is the result of interaction between a natural event and demand placed on water supply by human use. Drought as a natural disaster is peculiar due to its slowness and lengthy duration. The severity of the drought depends upon its duration, the degree of moisture deficiency, and the size of the affected area (Karamouz,2015). Drought is a hazard that requires many months to emerge and that may persist for many months or years thereafter. This type of hazard is known as a "creeping hazard" (Abdel,2014) and results in serious economic, social, and environmental impacts.

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WILEY

RESEARCH ARTICLE

Metamaterial inspired featherlight artificial plasma horn antenna for astronomical and communication applications

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Abstract

In this article, we introduce a novel type of horn antenna constructed using artificial plasma sheets. This metamaterial inspired negative permittivity antenna fabricated using thin metallic wires in a specialized manner is observed to have same radiation performance of an equivalent conventional metallic horn structure. This novel plasma antenna can replace the conventional one in all microwave applications. The featherlight weight and the ability to remove the problems related with wind resistance and rain accumulation of this new structure may result in a rethinking of the use of horn antennas in astronomical data collection.

KEYWORDS

artificial plasma medium, horn antenna, metamaterials, radiation pattern, satellite application

1 | INTRODUCTION

From its introduction by J. C. Bose, horn antennas were extremely popular in all fields of microwave application including astronomical research due to its moderate bandwidth, high gain, good power handling capability and ease of fabrication. Modified versions of horn antennas are extensively used as the primary feed in parabolic reflectors and as a universal standard for calibration and gain measurements.[1,2] To make the pyramidal horn more compact, many approaches that include dielectric loading[3–5] and lens-correction[6] have been considered. Further approaches like loading by metal baffles[7] have also been considered for modifying its radiation characteristics. However, these modifications make the structure heavy and expensive which cause them not suitable for many applications like space research.

In recent years, researchers have attempted to give modifications to horn antennas by making use of metamaterial inclusions of negative permeability medium (split ring resonator) and negative permittivity wire medium (artificial plasma). The effects of incorporating a wire medium inside horn antennas have been investigated by simulation and experimental studies.[8] In this article, we present a novel type of horn antenna constructed by replacing the metallic walls of a conventional horn structure with artificial plasma sheets. Usually negative permittivity metamaterial sheets are constructed using periodic array of thin metallic wires in a 3D manner. But even a single layer of periodic wires can be considered as artificial plasma (sheet of thickness equal to the diameter of the wire) with effective medium parameters.[9] Here the plasma sheets are specially oriented for maintaining the field distribution inside the new horn as in a conventional metallic horn structure.

2 | ANTENNA FABRICATION

The schematic diagram of the proposed plasma horn antenna is presented in Figure 1. Plasma structure constructed using thin copper wires is attached to the wave guide via a pyramidal launcher of length 2 cm. The axial length of the horn is 14 cm and the flare angles in E and H planes are 30° and 40°, respectively. Plasma medium for constructing the sidewalls of the horn structure is made of a single layer of thin metallic wires of radius 250 μm arranged with a periodicity of 5 mm in the H walls and an angular spacing of 2° with respect to the apex of the horn in the E walls. The

Damage to paddy *Oryza sativa* by Indian Peafowl *Pavo cristatus* near Chulannur Peafowl Sanctuary, Kerala, India

Suresh K. Govind & E. A. Jayson

Govind, S. K., & Jayson, E. A., 2018. Damage to paddy *Oryza sativa* by Indian Peafowl *Pavo cristatus* near Chulannur Peafowl Sanctuary, Kerala, India. *Indian BIRDS*. 14 (5): 149–150.

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Introduction

India's national bird, the Indian Peafowl *Pavo cristatus* (*henceforth*, peafowl), is listed under Schedule I of the Indian Wildlife (Protection) Act, 1972, and in Appendix I of the CITES treaty. It is omnivorous and gregarious, and is seen in open, and deciduous forests, different types of plantations, and human habitations (Ali & Ripley 1980; Grimmett *et al.* 2011). It faces the threats of poaching for its meat, feathers, and for use in traditional medicines. Accidental poisoning is another major threat (Alexander 1983; del Hoyo *et al.* 1994; Chakkaravarthy 2002; Ramesh & McGowan 2009). Crop depredation by peafowl is a serious issue, and has been reported from some areas in India (Johnsingh & Murali 1980; Veeramani & Jayson 1995; Ogra & Badola 2008; Karanth *et al.* 2012; Pradhan *et al.* 2012). As the actual economic loss was not estimated in these studies, farmers could not claim ex-gratia payment from the wildlife authorities. The situation will be exacerbated when the wildlife authorities prioritise the needs of wild animals above the needs of humans (Madden 2004). Quantifying the damage, and immediately disbursing sufficient ex-gratia to the victims could ameliorate the human-animal conflict (Nyhus *et al.* 2003). In India, as mentioned above, no studies have been conducted to measure the extent of crops that peafowl damage. In this paper, an attempt has been made to study the human-peafowl conflict, with the objective of estimating the extent of paddy *Oryza sativa* damaged, by peafowl, near the Chulannur Peafowl Sanctuary, Kerala, India.

Study area

The Chulannur Peafowl Sanctuary (10.70°–10.73°N, 76.45°–76.48°E; *henceforth*, CPS) is located near Thiruvillvamala village, and comprises 3.42 km² of forests spread over the districts of Thrissur, and Palakkad (Fig. 1). The area was declared a sanctuary in 2007. Its deciduous forest, with open areas and rocky patches, offers an ideal habitat for peafowl.

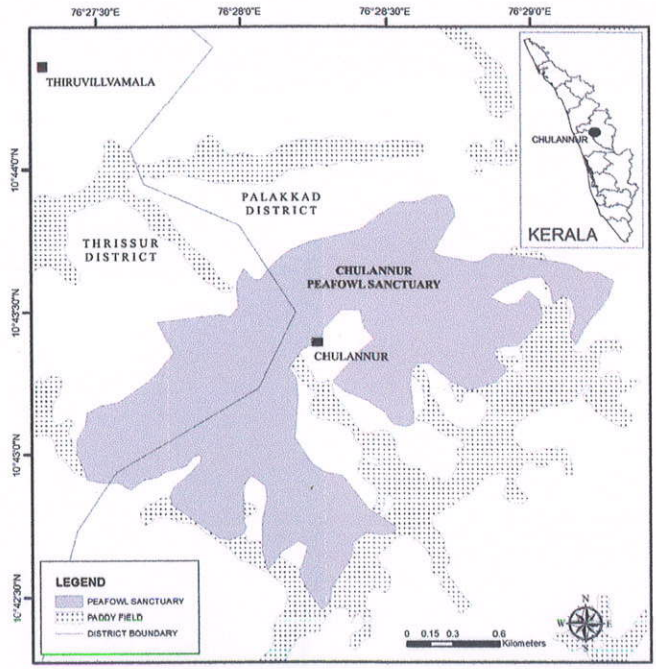

Fig. 1. Chulannur Peafowl Sanctuary, Central Kerala, India

Methods

We assessed the consumption of paddy by peafowl, using the enclosure experiment of Wilson *et al.* (2009), which we conducted in the paddy fields adjacent to CPS. This was part of a detailed study on human–wildlife conflict in central Kerala, from April 2009 to March 2012.

Plots of paddy were enclosed within net-covered metallic frames (10 m x 10 m) to protect them from damage **[166]**. They functioned as our control plots. Paddy depredation was quantified by comparing the yield of paddy from the control plots, with that of the open plots (10 m x 10 m). Two control plots, and two open plots were monitored in four trials in December 2009, September 2010, December 2010, and September 2011, at different locations of CPS. The mean distance from the forest boundary to the area of experiment was 112.5 ± 47.87 m.

Results

Peafowl were observed feeding on paddy at dawn (0600–0900 hrs), and dusk (1600–1900 hrs), over a total time of observation of 395 hours. The birds consumed the paddy by stripping off the grain from the panicle with their beaks. The mean daily

SHORT NOTE

ATTACK OF OTTER ON HUMANS IN THRISSUR, KERALA, INDIA

Suresh K. GOVIND and E.A. JAYSON

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(received 5th February 2015, accepted 15th November 2017)

Abstract: Human-otter conflict is a rare phenomenon, but has been reported from North and South America, and the Indian sub-continent. This paper reports on three Smooth-Coated otter (*Lutrogale perspicillata*) attacks in Thrissur, Kerala, India, discovered during a detailed study of human-wildlife conflict which ran from April 2009 to March 2012. Focus group discussion was carried out with local people with follow-up of individual anecdotes. One fatal and two non-fatal attacks were reported; ex gratia payments to victims were sanctioned by the Kerala Forest and Wildlife Department. All attacks were by groups of otters at dawn or dusk. Two incidents were in the breeding season (August to November) and one in June 2011. The reason for the attacks appears to be territorial.

Keywords: Smooth-coated otter, human-otter conflict, Kerala, India

INTRODUCTION

Three species of otters inhabit India, and the Smooth-coated otter (*Lutrogale perspicillata*) is common in Kerala (Menon, 2014) and mainly feeds on fishes (Prater, 1965). Bite attacks of otters on humans were reported from North America (*Lontra canadensis*) (Potter et al., 2007) and South America (*Pteronura brasiliensis*) (McTurk and Spelman, 2005). Several anecdotal incidents of human-otter (*Lontra canadensis*) conflicts and rabies infection within the species were reported by Belanger et al. (2011). An attack by Smooth-coated otter at Tungabadra, India was reported by Nagulu (1992). In this paper, Smooth-coated otter (*Lutrogale perspicillata*) attacking people in Thrissur District, Kerala, India is reported. Hunting of smooth-coated otter is illegal as this species is protected by the Wildlife Protection Act of India.

STUDY AREA

Thrissur District (10°46' to 10°7' N and 75°57' to 76°55' E) is in the central part of Kerala State, India, spanning an area of about 3,032 km^2. The District has a tropical humid climate and plentiful seasonal rainfall (2500 mm to 3500 mm). The study area is comprised of 11 Forest Ranges within three Forest Divisions namely Thrissur (210.64 km^2), Chalakudy (279.71 km^2) and Vazhachal (413.94 km^2) and three

Coconut (*Cocos nucifera*) damage by wild pig (*Sus scrofa*) and Indian crested porcupine (*Hystrix indica*) in Central Kerala, India

Crop damage by wild animals is a serious concern faced by marginal farmers in Kerala[1]. As the farmers cultivate a variety of cash crops namely coconut (*Cocos nucifera*), arecanut (*Areca catechu*) and rubber (*Hevea brasiliensis*) in the immediate fringe areas of the forest, damage and consumption of the fallen coconuts by wild pig (*Sus scrofa*) and Indian crested porcupine (*Hystrix indica*) is a serious issue[1,2]. Both the species are distributed in all the forest types in India[3] and reported as frequent crop raiders in Kerala[4]. Mode of feeding on coconuts by wild pig and Indian crested porcupine was not reported in the previous studies[1,2]. Wild pig damaged a variety of crops in India[5,6], China[7] and Bhutan[8]. In European countries, crop raiding was seasonal based on the type of crops cultivated[9]. Schley and Roper[10] reported that wild pigs prefer agricultural crops due to their nutritive value. Indian crested porcupine damaged different crops in north India[11] and Pakistan[12]. Chakravarthy *et al.*[13] reported that degradation and fragmentation of the forest habitat compelled Indian crested porcupines to move to human habitations and cause damage to the crops. The study was carried out in Thrissur district (10°46′–10°7′N and 75°57′–76°55′E), central Kerala, India, as a part of a study on human–wildlife conflict from April 2009 to March 2012. The objectives of the study were to quantify the damage and consumption of fallen coconuts, with special reference to their mode of feeding and to identify the species involved in damage from the indirect evidences based on the shape and length of the discarded coconut husk.

For quantifying the damage to fallen coconuts, four quadrats of 10 m × 10 m were laid systematically in the coconut plantations up to 200 m away from the reserve forest in each forest range[4]. Ten coconut trees were marked from these plots in the Wadakkancherry, Pattikkad and Peechi forest ranges. Twenty trees in Machad forest range, 11 trees in Charpa forest range, 9 trees each in Vellikulangara and Pariyaram forest ranges and 6 trees in Palapilly forest range were marked from the plots. The presence of wild pig and Indian crested porcupine in the quadrats was recorded in each month ($n = 36$) based on the indirect evidences left by these species such as scats, droppings, diggings, feeding signs and scratching marks. The coconuts consumed/tree were also recorded during each visit. Percentage occurrence of the two species based on indirect evidences was calculated by dividing the number of occurrence of these species in the quadrats in each month by total months observed ($n = 36$) and multiplying this by 100. The shape and length of the removed mesocarp (coconut husk) was measured using vernier calipers ($n = 40$).

Wild pig was recorded from all the forest ranges in the district. Highest occurrence was recorded from Wadakkancherry forest range and the feeding on coconuts was maximum in Palapilly forest range (Figures 1 and 2). Mean coconut consumed per tree was 0.12 ± 0.15 coconut/tree/month ($n = 8$). The mode of consumption was by removing the mesocarp (husk) and endocarp and consuming the endosperm. The removed mesocarp (husk) had an irregular shape at the tip with a size of 15.01 ± 1.65 cm in length and 3.09 ± 0.73 cm in breadth ($n = 20$) (Figure 3). Coconuts were dragged to the forest before consuming them ($n = 19$). Indian crested porcupine was recorded from all the forest ranges, except Charpa forest range. The highest occurrence and damage to coconuts were recorded from Vellikulangara forest range (Figures 1 and 2). Mean coconut consumed per tree was 0.06 ± 0.09 coconut/tree/month ($n = 8$). Like the wild pig, the coconuts were damaged and

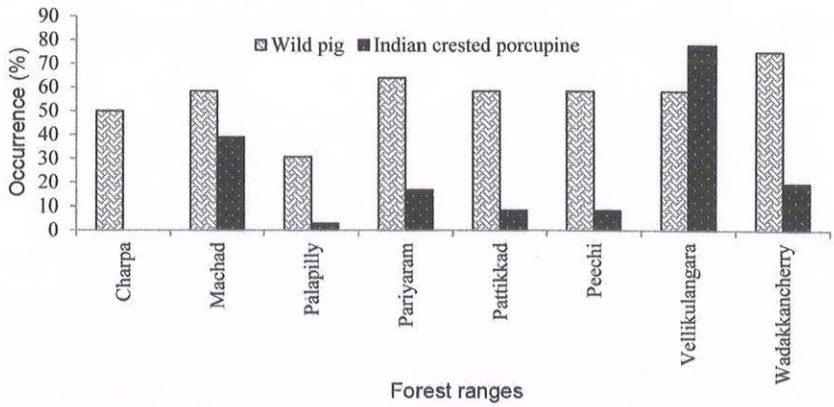

Figure 1. Percentage occurrence of wild pig and Indian crested porcupine in the fringe areas of different forest ranges (Thrissur district, Kerala) ($n = 36$).

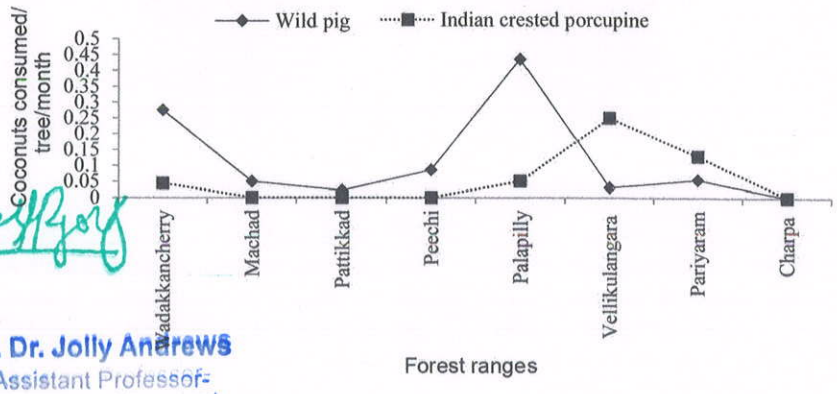

Figure 2. Number of coconuts consumed by wild pig and Indian crested porcupine in the fringe areas of different forest ranges (Thrissur district, Kerala).

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Review Articles

Role of gut inhabitants on vectorial capacity of mosquitoes

Lekshmi Jayakrishnan[1], Ambalaparambil Vasu Sudhikumar[2]& Embalil Mathachan Aneesh[1]

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ABSTRACT

Mosquito-borne diseases are spreading at an alarming rate. Globally millions of deaths occur due to the diseases transmitted by mosquitoes, next to AIDS and tuberculosis. Several methods have been used to control these vectors and the diseases caused by them. Earlier studies have shown the potential role of mosquito gut inhabitants on disease transmission. Their findings can be used as an innovative approach for devising strategies to modify the survival of mosquitoes by reducing their lifespan, reproduction and disease transmission abilities. In this study, microbiome of the three genera of mosquitoes, namely *Aedes, Anopheles,* and *Culex* along with their vectorial capacity have been reviewed for assessing their role in mosquito control and transmission. Relevant articles were accessed using different databases, including LILACS, Embase, Science Direct and PubMed from inception to June 2017. The search keywords included "*Aedes*", "*Anopheles*", "*Culex*", "gut inhabitants", "vectors", and "mosquito". The titles, abstract, and keywords of the retrieved articles were screened, and eligible research articles were sorted. The review indicates that paratransgenesis may be considered as a versatile and effective strategy to eradicate the spurt of mosquito transmitting diseases. *Enterobacter* species is the most common type of gram-negative bacteria associated with the gut of all the three genera of mosquitoes. It was found to have a beneficial effect on humans as it helps in destroying dreadful disease-transmitting vectors. These symbiotic qualities of the microbes need to be thoroughly investigated further to reveal their antipathogenic effect on the vector.

Key words *Aedes; Anopheles; Culex*; gut inhabitants; microbes; mosquito; vectorial capacity

INTRODUCTION

Mosquitoes, the hexapod invertebrates belonging to the Culicidae family of Insecta class, have profound influence on human beings. More than 3555 recognized mosquito species divided into two subfamilies (Anophelinae and Culicinae) and 112 genera have been recorded in different parts of the world[1]. India, belonging to the oriental region is regarded as one of the richest biogeographic zones for different mosquitoes. A record indicates that Indian mosquito fauna includes 393 species divided among 49 genera and 41 subgenera[2]. Most species of this holometabolous insect remains as nonpathogenic, while some are vectors of certain dreaded diseases like malaria, chikungunya, Zika, yellow fever *etc*. More than one million people die every year throughout the world due to mosquito-borne diseases[3–6].

The vector competences of mosquitoes are highly dependent on the microenvironment of their gut which normally undergoes radical structural remodeling during each stage of the life cycle[7]. Hence, studies on gut content analysis of mosquito in terms of feeding (which includes diverse form of microbial flora composed of commensal or symbiotic bacteria, algae, protozoans, organic debris *etc*) are essential, as their feeding behaviour changes during metamorphosis from an aqueous larval stage to an aerial adult[8]. Studying the interaction between the gut microenvironment and vector competency might be helpful in controlling vector-borne diseases without disturbing the ecological balance. Accordingly, a systematic review was made, intended to reveal the characteristic features of microbial consortia residing in the mosquito gut. For this different published research articles and reviews were assessed using the online databases, *viz.* LILACS, Excerpta Medica data BASE (Embase®), Science Direct and PubMed® from inception to June 2017. Other sources consulted were the CDC, WHO, and NIH websites. The search keywords included "*Aedes*", "*Anopheles*", "*Culex*", "gut inhabitants", "vectors", and "mosquito". Articles retrieved for the study were absolutely in English. The titles, abstract, and keywords of the retrieved articles were screened, and eligible research articles were sorted. The selected articles were considered reliable, if they revealed one or more perspectives about the research

Arthropoda Selecta 27(4): 330–334

A new species of the jumping spider genus *Icius* Simon, 1876 from India (Aranei: Salticidae: Chrysillini)

Новый вид из рода пауков-скакунчиков *Icius* Simon, 1876 из Индии (Aranei: Salticidae: Chrysillini)

Dhruv A. Prajapati[1,2], Jobi J. Malamel[1,2*], Ambalaparmbil V. Sudhikumar[1,3], Pothalil A. Sebastian[2]
Дхрув А. Праджапати[1,2], Джоби Д. Маламел[1,2*], Амбалапармбил В. Судхикумар[2], Потхалил А. Себастиан[2]

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KEY WORDS: jumping spiders, South India, new species, taxonomy, distribution.
КЛЮЧЕВЫЕ СЛОВА: пауки-скакунчики, южная Индия, новый вид, таксономия, распространение.

ABSTRACT. A new species of the jumping spiders — *Icius vikrambatrai* sp.n. (♂♀) — is described from South India. A detailed morphological description, diagnosis and illustrations of the copulatory organs are provided. Distribution of all the Indian *Icius* species is mapped.

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РЕЗЮМЕ. Новый вид пауков-скакунчиков — *Icius vikrambatrai* sp.n. (♂♀) — описан из южной Индии. Даны детальное морфологическое описание, диагноз и рисунки копулятивных органов. Распространение всех индийских видов *Icius* прокартировано.

Introduction

A total of 35 valid species has been known worldwide in the genus *Icius* Simon, 1876 [WSC, 2018], of which seven have been recorded/described from south and south-east Asia: viz., one species is known from Afghanistan, three from China, one from Indonesia and two from India. *Icius alboterminus* (Caleb, 2014) and *I. kumariae* Caleb, 2017 were recently described from both sexes from India [Caleb, 2014, 2017]. *I. alboterminus* was originally described in the genus *Phintella* Strand, in Bösenberg et Strand, 1906 and then transferred to *Icius* [Caleb, 2017]. In present paper we aim to describe a new species *Icius vikrambatrai* sp.n. (♂♀) from southern India.

Materials and methods

Samples were hand-collected. The specimens were studied by means of a LEICA S8AP0 stereomicroscope. All measurements are in mm. Length of the palp and leg segments are given as follows: total (femur, patella, tibia, metatarsus (except palp), tarsus). Spine positions are as follows: prolateral, dorsal, retrolateral and ventral. B/W drawings were made by means of a drawing apparatus attached to the LEICA microscope. Digital images were taken by a Leica DFC2900 digital camera attached to the Leica M205 A stereomicroscope with the software package Leica Application Suite (LAS), version 4.5.0. The studied specimens have been deposited in the reference collection of the Division of Arachnology, Department of Zoology, Sacred Heart College, Thevara, Cochin, Kerala, India (ADSH). Abbreviations used in the text. ALE — anterior lateral eye, AME — anterior median eye, PLE — posterior lateral eye, PME — posterior median eye, I–IV — 1st to 4th legs.

Taxonomy

Icius Simon, 1876

Type species: *Icius hamatus* C.L. Koch, 1846.
Diagnosis. For diagnostic features and description of the genus see Alicata & Cantarella [1994].

Icius vikrambatrai **sp.n.**
Figs 1–17, Map.

TYPES: Holotype male (ADSH872381) from India, Kerala, Alappuzha, Pathiramanal Island (9°37'07.11"N, 76°23'04.95"E),

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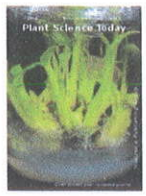

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Review Article

Larvicidal activity of phytoextracts against dengue fever vector, *Aedes aegypti* - A review

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Abstract

Since *Aedes aegypti* is considered as the major vector of dengue fever, development of strategies to accomplish improved vector control without much interference in the environment composition are more common. As phytochemicals are now in the run for achieving this goal, this review is a humble attempt to recognize the plant species and their larvicidal efficacy with their inhibitory action on the life cycle of the species of interest, that has been documented through various studies conducted till date. Here we also discuss the synergistic impact of a number of phytoextracts which will provide more efficient control measures for mosquito vectors. All these studies are an exploration for a risk-free vector control tactic to replace the current chemical insecticide application for the betterment of our nature.

Keywords

Aedes aegypti; phytoextracts; larvicidal activity; susceptibility

Citation

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Introduction

Mosquitoes are considered as the principle vectors of several diseases affecting humans and animals which include dengue, filariasis, chickungunya, Japanese encephalitis, malaria, etc, which result in thousands of deaths every year. Among these, dengue fever is measured as one of the noxious diseases due to its high mortality rate and increasing pervasiveness (1). The rate of recurrence of dengue has grown significantly around the globe in current times. According to recent reports, it is estimated that almost three ninety million people across the world are infected per year of which ninety million are in severe state (2,3). Most of the outbreaks of this disease remain unpredictable and are spreading to new areas, which result in an irrepressible increase in the occurrence of cases. Based on the data collected by National Vector Borne Disease Control Programme in India, dengue fever was first accounted in 1956 from Vellore

USUAGE OF E-WALLETS AFTER DEMONETISATION

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Abstract : De-monetization has given a big boost to the digital payment platforms in India. They are fast, reliable, easy to learn and navigate. It is able to fulfill the requirement specifications. Immediately after demonetization, citizens were facing severe cash problems. Along with this the rate of usage of e-wallets shows an upward trend. Security is still a major concern regarding these platforms like e-wallets. This paper looks at the impact that Demonetization has had on the e-wallets in India. Specifically, it aims to see how the e-wallets have evolved with the advent of demonetization .

IndexTerms- De-monetization, E-wallets.

I. INTRODUCTION

Demonetization generations memorable experience and is going to be one of the economic events of our times. Its impact is felt by every Indian citizen. Demonetization affects the economy through the liquidity side. On 8th November 2016, prime minister announced that 80% of the currency in circulation was stopped. Shortages of currency notes create an uncertainty in day by day money transactions. To overcome these problems central government promotes cashless transactions in place of currency transactions.

After results of demonetization people started using digital payment methods like e-wallets, debit cards, internet banking, etc. E-wallets become popular now a day. Paytm, Mobikwick, freecharge, Oxigen etc are the most popular e-wallets in India. E-wallets are prepaid accounts in which a user can store his money for future online transactions. Its password protected also. Using e-wallets, it's+ possible to make online transactions like mobile, dth, electricity bills, flight tickets etc. Convenience, less time consuming. Zero cost etc is some of the features that made e-wallets as one of the most popular digital payments methods among people in India.

II STATEMENT OF THE PROBLEM

Demonetization created an uncertainty in the economy. There for people started depending more on digital payment systems like

e-wallets. So this study is to check the rate of usage of e-wallets after demonetization.

2.1 SIGNIFICANCE OF THE STUDY

After demonetization, our economy experienced a shortage of currency notes. E-wallets are a convenient tool for making digital payments. This study is relevant since its helps to know about the increase of dependence on e-wallets after demonetization.

2.2 SCOPE OF THE STUDY

This study covers the usage of various e-wallets like paytm, oxygen etc among college after demonetization.

2.3 OBJECTIVES OF THE STUDY

1) To understand the difference in usage rate of e-wallets after and before demonetization.
2) To assess the usage experience and perception of e-wallets among chosen people.
3) To understand the awareness about various digital payment systems among people before and after demonetization.
4) To analyze the effect of demonetization in digital payment system.

2.4 RESEARCH DESIGN AND METHODOLOGY

This study covers 50 e-wallet users among the students of Christ College, Irinjalakuda. Convenient sampling was the sampling technique adopted to select the required number of respondents. The study was conducted with the help of primary data. The data was collected through standard questionnaire. The collected data is coded and tabulated in order to organize them for interpretation. The tabulated data is also presented with the help of bar diagrams and pie charts. For organizing and presenting the data various statistical tools been used.

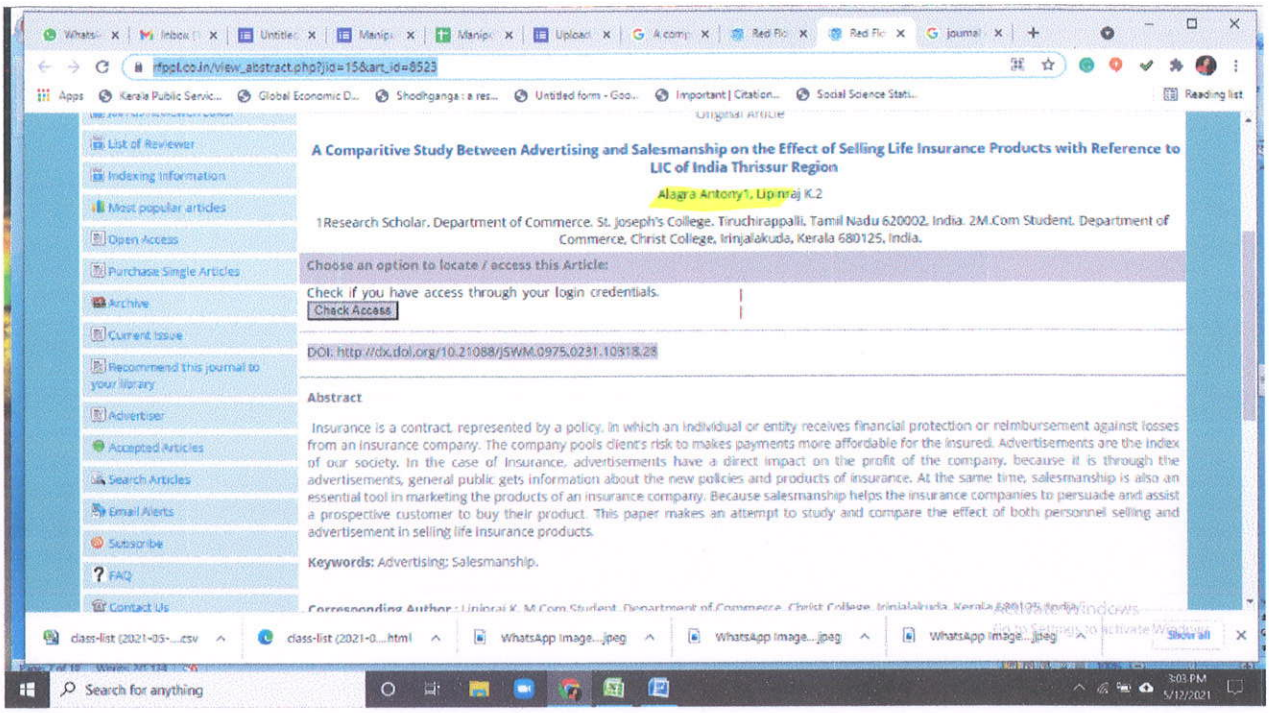
III ANALYSIS AND DISCUSSION

Table 1 - Opinion about cashless economy

Opinion	Good	Very good	Bad	Neutral
Number of response	20	10	5	15
Percentage	40	20	10	30

(Source: Primary data)

This table shows the opinion of respondents about cashless economy. It shows that most of the respondents (40%) are in favor of cashless economy. Only 10% has an opposite opinion. 30% gives a neutral opinion.



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Original Article

A Comparitive Study Between Advertising and Salesmanship on the Effect of Selling Life Insurance Products with Reference to LIC of India Thrissur Region

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Abstract

Insurance is a contract represented by a policy, in which an individual or entity receives financial protection or reimbursement against losses from an insurance company. The company pools client's risk to makes payments more affordable for the insured. Advertisements are the index of our society. In the case of insurance, advertisements have a direct impact on the profit of the company, because it is through the advertisements, general public gets information about the new policies and products of insurance. At the same time, salesmanship is also an essential tool in marketing the products of an insurance company. Because salesmanship helps the insurance companies to persuade and assist a prospective customer to buy their product. This paper makes an attempt to study and compare the effect of both personnel selling and advertisement in selling life insurance products.

Keywords: Advertising; Salesmanship.

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CHRIST COLLEGE (AUTONOMOUS) IRINJALAKUDA

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CONTENTS

IMPACT OF MUSIC IN REDUCING STRESS

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ABSTRACT

Stress is what you feel when you have to handle more than you are used to. When you are stressed, your body responds as though you are in danger. It makes hormones that speed up your heart, make you breathe faster, and give you a burst of energy. This is called the fight-or-flight stress response. Some stress is normal and even useful. Stress can help if you need to work hard or react quickly. Stress management *is a process for controlling an individual's level of stress. Stress management may include practicing daily meditation, identifying relaxing activities (which may be different for every individual), or a combination of multiple techniques. Stress management is important because chronic stress can wreak havoc on your body's immune system and contribute to health problems such as tension headaches, migraine headaches, insomnia, weight gain, depression, anxiety, digestive problems, and even heart disease. Both acute and chronic stress impact memory and concentration, making effective stress management crucial for optimal day-to-day functioning.So there are quite a lot of stress management techniques and In this study the researcher has thrown some light on how people manage their stress and overcome it using music.*

INTRODUCTION

An organization is made up of four resources, namely, men, material, money and machinery. Of these, the first one is living one, i.e., human and the other three are non-human. It is the human/people that make use of non-human resources. Hence, people are the most significant resources in an organization. It is man who makes all the differences in the organization. ***L.f.Urwick*** had remarked that "business house are made or broken in the long-run not by markets or capital, patents, or equipment's, but by men". According to ***Peter F. Drucker***, "man, of all the resources available to man, can grow and develop. Human resources is used to describe both the people who work for a company or organization and the department responsible for managing resources related to employees. The term *human resources* was first coined in the 1960s when the

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A study on Youth Buying Behaviour and Brand Preference towards Mobile Phones in Thrissur District

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Corresponding Author: Dr Josheena Jose

Abstract: *To study on customer purchase behaviour towards mobile phone. Customer buying is not mere transfer of item from seller to buyer. Consumer wants buying to become a happy affair. They would like to see, touch and feel the commodities that they buy. Understanding this psychology for the consumer many organizations have come to make purchase of happy affair. Today different brands of mobile phones are available to users. Mobile phones are one of the modern telecommunication technologies that have emerged over past decades to facilitate communication among people and across countries. Thus, the present study focuses on the factors which influencing the consumer to purchase Mobile Phones. This study helps to know the buying behaviour of the consumer while choosing Mobile Phones. This study also helps to know the consumers satisfaction level towards different branded mobile phones.*

Key words: *purchase behavior, telecommunication technologies, consumers satisfaction, brand preferences and Cell phones*

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I. Part

1.1Introduction

Today different brands of mobile phones are available to users. Mobile phones are one of the modern telecommunication technologies that have emerged over past decades to facilitate communication among people and across countries (Dziwornu, 2013). According to the oxford dictionary the word mobile is derived from the Latin phrase 'mobile vulgus'. Which means excitable crowd .In human life there is the great change in standard of living by the invention of mobile phones? As we all familiar cell phones did not just happen overnight. They evolved just like us. Cell phones has evolved over five different generations, the latest of which is still being adopted by users. By the time most of us will have switched to *4G* and there will be undoubtedly be yet another standard to aspire.

As we all know that first mobile phone launched in India during 1990's and first mobile company which was established is *Nokia* .In the year 1995, the first service provider Modi group which was established in Kolkata .Now India is second largest user of mobile phones that is accountable for 1,034,253,328 mobile phones. These indicates how widely mobile phones are accepted .There are many available brands to users like Samsung, Micromax , Lenovo, Motorola , Intex ,Lava , Xiaomi etc .As we can that youth is more attracted to mobile phone usage . The current mobile market has close relationship with the youth .Whenever a new multimedia or electronic gadget is launched ,just see the queue in any outlet you will see large number of youngsters filling the crowd. This shows the growing popularity of mobile phones among youngsters .This study seeks to analyze the brand preferences among youth.

1.2 Statement of Problem

During 19th century markets was not so competitive. There was very few brands competing in the market and there were people using mobile phones as they used to be very expensive. During 20th century many new brands of mobile phones have been introduced in the market. Even in our country new telecommunication companies have been established making the service very cheaper so that the service can be utilised by every common people of the country. Today mobile phones start from Rs.1000 to Rs.1, 00,000 because of which today people have lots of options regarding mobile phones. Mobile phones have become very common to the people and life has become almost impossible without mobile phone.

To compete in a market many cheaper mobile phones have been introduced in a market especially from India and China providing additional accessories and feature to customers. But there is a question regarding selection brands by consumers and factors affecting while purchasing mobile phones study therefore, desirable to identify the brand preferences among youth.

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CHRIST COLLEGE (AUTONOMOUS) IRINJALAKUDA

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Irinjalakuda

'CULTURE SHOCK' – A THEORITICAL FRAMEWORK

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Abstract

In the modern world 'Culture shock' has several negative effects in the field of education and in the workplace. Most international students and foreign workers experience culture shock. In India since the IT boom took place, salaries are at an unbelievable high. Due to the attractive salary packages offered in the IT sector, this sector has attracted employees from all parts of the country and even from across the globe. The workplace has become a meeting place of various 'cultures'. Yet little research exists which has investigated the factors leading to culture shock. In this paper an attempt is made to investigate the factors leading to culture shock.

Key Words: Culture, Culture Shock, Globalization, Social withdrawal and Emotional discomfort

Part 1

1.1 Introduction

"Culture Shock" has been a topic of research for over 30 years by European and American anthropologists and psychologists (Eickelmann, 2006). It is usually used to describe the physical and emotional discomfort experienced when someone moves to a completely new environment, although it also may result in a positive learning experience leading to increased self-awareness and personal growth (Adler, 1987). Paul Pedersen (1995), a cross-cultural psychologist and a professor of educational Syracuse University in the Department of Human Services, defined culture shock as the process of initial adjustment to an unfamiliar environment. He pointed out that this psychological construct of culture shock has been used to describe the adjustment process in its emotional, psychological, behavioral, cognitive and physiological impact on individuals. Geert Hofstede, one of the pioneers on the field, an international authority on cross-cultural social psychology, the aforementioned personality Paul Pedersen and Gert Jan Hofstede, son of Geert Hofstede, a senior researcher in Information Technology at Wageningen

A STUDY ON FACTORS AFFECTING THE EMOTIONAL INTELLIGENCE OF TEACHERS

Femy O A, Assistant Professor, SreeKeralaVarma College, Thrissur

DrJosheena Jose, Assistant Professor & Research Guide,
PG Department of commerce, Christ College (Autonomous) Irinjalakuda

Abstract

Emotional Intelligence is of great importance in education and teaching because it helps the teachers to understand their students in a better way. A teacher with weak emotional intelligence cannot guide and motivate students positively. But a teacher with emotional balance can motivate students positively. It prevent stress and help them to deal with complicated situations in classroom without affecting the students. Empathy a key emotional intelligence skill is very much essential for a teacher to understand and impart the learning in a way suitable to the background and culture of the students. The social skills and motivation are useful for the teachers to achieve the objectives of the subject being taught.

Keywords: Emotional intelligence, Empathy, self awareness, social skills

Part 1

1.1 Introduction

Today education plays a very important role in developing individuals both physically and mentally. In Kerala priority is always given to education and literacy. So Kerala is ranked as one of the most literate state in India. The government is spending quite a number of amount in developing the infrastructure and quality of the schools and colleges. Kerala being highly literate, the government and the teaching community had and are playing a vital role to see that most of the people are at least able to read and write. Teachers play a very important role in the education system. They play a number of roles among students such as teacher, guide, mentor, friend and philosopher etc. The present study is going to conduct among college teachers. A teacher is a friend, therapist, tutor, counsellor etc. of students who have a wide range of learning, mental, emotional and physical disabilities. So the teachers must have the ability of emotional intelligence skills. Then only they can truly guide their students. Emotional Intelligence is of great importance in education and teaching because it helps the teachers to understand their students in a better way. A teacher with weak emotional intelligence cannot guide and motivate students positively. But a teacher with emotional balance can motivate students positively. It prevent stress and help them to deal with complicated situations in classroom without affecting the students. Empathy a key emotional intelligence skill is very much essential for a teacher to

'A CONCEPTUAL STUDY ON OCCUPATIONAL STRESS AMONG INDIAN SOLDIERS UNDER PERSONNEL BELOW OFFICER RANK'

Ancy Antony Vattoly, Research Scholar, St.Joseph's College(Autonomous) Irinjalakuda

Dr Josheena Jose, Assistant Professor & Research Guide, PG Department of Commerce, Christ College (Autonomous),Irinjalakuda

Abstract

The aim of this paper is to study the various factors causing occupational stress and its effect on individuals and the organization, as a whole. It identifies the major factors of stress, classifiable into nine categories i.e., job content, work load and work place, working hours, participation and control, career development, status and pay, role in organization, interpersonal relationships, organizational culture and home-work interface. Here, an attempt is made to study the factors of occupational stress and its effects on Indian soldiers under PBOR (Personnel Below Officer Rank).

Key Words: Occupational stress, interpersonal relationship, organizational culture, home-work interface, PBOR

1.1 Introduction

The security and sanctity of our nation has been threatened, time and again, in the past and in order to defend the same in conflicts which may take place in the future, the Indian Army needs a physically and mentally strong armed force. But no human being can be exempt from stress. Apart from instigating several lifestyle ill-habits, chronic diseases, childlessness and hormonal variations, stress has also triggered a tendency to commit fratricide in individuals displaying violent traits and suicidal tendencies in distressed individuals. There were as many as 635 cases of suicide and 67 cases of fratricidal killings in the three services of Armed Forces from 2003 to 2007, of which the Army was the worst affected.

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A STUDY ON THE JOB SATISFACTION AND INSTITUTIONAL COMMITMENT AMONG SCHOOL TEACHERS IN KERALA WITH SPECIAL REFERENCE TO MALAPPURAM DISTRICT.

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Dr Josheena Jose
Assistant Professor , PG Department of commerce, Christ College (Autonomous) Irinjalakuda

Abstract

Teachers are pillars our nation. Teacher plays an important role in developing the knowledge and skill of youth. This study aims at investigating the job satisfaction and institutional commitment among school teachers in Malappuram district. 30 respondents from government school, 30 respondents from aided schools and 30 respondents from private school were taken for the purpose of the study. Data collected was analysed with both descriptive and inferential statistics using spss version 21. Independent sample t-test and chi-square test has been used in this study to analyse the job satisfaction and institutional commitment level among male and female teachers and government, aided and private school teachers. On comparing the job satisfaction level and institutional commitment between government and aided and public school teachers. Job satisfaction influences job commitment towards the institution

Key words: job satisfaction, Institutional commitment, organisational climate, government school, private school, aided school, gender

1.1 Introduction

High quality teaching staff is the cornerstone of a successful educational system. Teachers are both the largest human capital resource of an educational system, particularly at the school level. Attracting and retaining high quality teachers is thus a primary necessity for educational institution. However, good teachers are difficult to recruit and almost impossible to retain if the rewards of teaching do not outweigh the possible frustrations on account of poor job conditions. Job satisfaction has always been a flash point of discussion among the researchers and scholars since along. This critical issue has gained enthusiastic attention of researchers all around the world after the

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SPATIOTEMPORAL LANDCOVER CHANGE ANALYSIS IN PEPPARA WILDLIFE SANCTUARY, WESTERN GHATS, INDIA

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Abstract: **Land cover, defined as the assemblage of biotic and abiotic components on the Earth's surface, is one of the most crucial properties of the Earth system .Vegetation is a vital component of the natural environment. Terrestrial vegetation includes natural ecosystems, such as native forests and woodlands, shrub lands, grasslands and wetlands. Information on land cover is fundamental to many national/global applications including watershed management and agricultural productivity. Thus, the need to monitor land cover is derived from multiple intersecting drivers, including the physical climate, ecosystem health, and societal needs. Tropical forests have undergone rapid land cover changes especially in the last few decades. Terrestrial forest is one of the major factors in the global carbon balance, and therefore in global climate change. Change in forest cover may also have affected past climates on regional or sub-continental scales. Forest cover change accelerates the climate change and global warming. The present study analyses the Landcover change in the Peppara wildlife sanctuary for a period of forty years using GIS and Remote sensing techniques.**

Keywords: **GIS, Remote sensing, vegetation, wildlife sanctuary.**

1. INTRODUCTION

The composition, diversity, and structure of vegetation are the key determinants in assessing biological diversity of forest ecosystems. Vegetation is the source of primary production which plays a direct role in water and nutrient cycling, and interacts strongly with other biotic components. Vegetation has also been identified as a specific target for the calculation of critical loads/levels. 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). Terrestrial forest is one of the major factors in the global carbon balance, and therefore in global climate change (Franceyet *al.*, 1995; Fang *et al.*, 2001). Change in forest cover may also have affected past climates on regional or sub-continental scales. Forest cover change accelerates the climate change and global warming (Ruddiman, 2003). Land use/land cover is a fundamental variable that impacts the forest fragmentation and isolation of habitats, which is being linked with human and physical environments (Giriraj*et al.*, 2010). Forest cover changes may have been important consequences for natural and forest landscapes through their impacts on soil and water quality, biodiversity, and global climatic systems (Chen *et al.*, 2001). Vegetation mapping is a product of the development of remote sensing, initially through aerial photography, remote sensing technology, because of the benefits it offers wide area coverage, frequent revisits, multispectral, multisource, and storage in digital format to facilitate subsequent updating and compatibility with GIS technology proved very practical and economical means for an accurate classification of land cover (Nafeesa*et al.*,2010, Lillesand and Kiefer, 1999). Forest cover change detection techniques have been developed for monitoring land cover dynamics from remotely sensed imagery (Coppin *et al.*, 2004; Lu *et al.*, 2004, Roy and Roy, 2010). The present analysis of land use and land cover

13th International Congress on Artificial Materials for Novel Wave Phenomena - Metamaterials 2019
Rome, Italy, Sept. 16th - Sept. 21th 2019

Wide Band Microwave Absorber using Flexible Broadside Coupled Split Ring Resonator Metamaterial Structure

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Abstract – **This paper proposes a wide band microwave absorber in a bulk form realized using a Broad Side Coupled Split Ring Resonator (BCSRR) metamaterial structural units fabricated in a novel way which possesses structural flexibility and wide band frequency tunability. Instead of using a conventional structure, the two conducting rings of the structure are prepared separately by photochemical etching using thin copper sheets glued on polypropylene film. The resonant property studies of the BCSRR show a noticeable tunability in resonant frequency with spacing variation, a result not observed using other conventional SRR structures. A spacing variation of 1 mm of a typical BCSRR unit shows around 3 GHz resonant tunability which makes it suitable for materializing various sensor applications. The resonant properties of BCSRR in a bulk form made with specific structural dimensions arranged in periodic manner with progressively varying spacing using layers of cotton fabric, show wide band resonant absorption. By suitably modifying the structural parameters of BCSRR rings, the range of the frequency absorption band can be specifically designed. The result of the study predicts a possibility of using this proposed BCSRR designs in various types of wide band absorbers.**

I. Introduction

There is vibrant research carried out by different groups in order to explore the potential possibilities and manifold applications of different types of Split Ring Resonators (SRRs) [1]. Broad Side Coupled Split Ring Resonator (BCSRR), one of the important candidates for negative permeability metamaterial resonating units, is widely used in different sensors, miniaturized antennas, frequency selective surfaces etc [2]. Conventionally BCSRRs are constructed by etching the rings of the structure on two sides of a single substrate and there by will have a fixed resonating frequency due to the thickness of the substrate used for selected structural parameters. By designing BCSRR in a novel way by fabricating the two rings on separate substrate of the same material, the spacing variation between the rings leading to wide band frequency tunability was easily achieved [3]. Instead of using rigid substrates for fabricating the rings, we have incorporated flexible, lossless microfilms as the substrate unit which will provide the added advantage of flexibility [4]. In this paper, such specially designed BCSRR units are periodically structured to materialize a bulk medium to achieve a noticeable wide band frequency absorption which is not possible with conventional structures.

II. Fabrication and Measurements

The rings of BCSRR are fabricated on thin copper sheets of thickness 20 μm. The substrate used is a polypropylene film of thickness 18 μm which is glued to the copper sheets. By using photochemical etching method the required BCSRR rings of specific dimensions are fabricated. Three sets of rings with inner radius r = 5.4 mm, 4.7 mm, 3.0 mm and width w= 2.7 mm, 1.8 mm, 2 mm and slit width d = 0.2 mm are precisely made. Cotton fabric strips of thickness of 0.1 mm are used for achieving the required spacing between the rings of the BCSRR. Planar array of BCSRR rings with periodicity 12 mm having five columns with varying spacing using different

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Rotation Sensor based on Near Field Perturbations of Metamaterial Split Ring Resonator

Anju Sebastian[1], Sreedevi P. Chakyar[1], C. Bindu [1,2], V. P. Joseph[1] and Jolly Andrews[1]

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Abstract – **This paper uses the field distribution properties of metamaterial Split Ring Resonators (SRRs) for the implementation of a rotation sensor. The proposed sensor structure includes a stator, which is a SRR and a rotor, a thin dielectric strip in the near field region of the resonator attached to the rotating axis of a stepper motor arrangement. The sensing principle is based on the shift in resonance frequency due to the change in effective capacitance of the SRR because of the perturbations in the field owing to the presence of the dielectric rotor. This novel and simple metamaterial inspired rotation sensor shows a linear response up to 45^0 with flexibility of changing the sensitivity of the proposed sensor. The possible non-linear issues involved for rotation up to 180^0 is also presented.**

I. Introduction

Metamaterial resonator structures like Split Ring Resonators (SRRs) have gained major attention in recent years due to its applications in the field of sensing and imaging. The attractive features of these microwave sensors include high sensitivity, high quality factor and high tunability[1]. The resonance frequency dependence of these artificially engineered materials is effectively utilized for the realisation of various sensors. Though different types of metamaterial structure related sensors have been introduced by some researchers, the field related analysis for the working of these sensors is seldom seen in literature. A few works already reported portraits the realization of the rotation sensor by the rotation of the SRR structure which changes the symmetry of the resonator [2]–[3].

In this paper, we introduce a novel rotation sensor in which the SRR probe is kept stationary where by the undesired movement effects are eliminated. The analysis is carried out by using the perturbation effects in the near field of the resonator caused by the non-contact rotation scanning of a dielectric strip whose dimensions along with the dielectric constant can be varied for enhancing the sensitivity.

II. Experimental Methods and Results

The experimental arrangement includes a SRR fabricated on a thin poly ethylene film [4] of thickness 18 μm and it is arranged precisely between the transmitting and receiving probes connected to a Vector Network Analyzer (VNA). SRR used for the sensing purpose is having an inner radius 2.43 mm, width of the metal rings 0.945 mm, spacing between the rings 0.245 mm and split width 1.36 mm. Dielectric strip of selected permittivity is fixed on a rotating axial made of low loss dielectric material and it is attached to a stepper motor arrangement so that the rotation can be electronically controlled. The entire experimental set up is shown in Fig. 1.

The resonant frequency of the SRR probe is determined by the intrinsic values of its capacitance and inductance. The presence of a dielectric in the near field [5] region of the SRR will enhance the effective capacitance which in turn will reduce the resonant frequency. Care should be taken to precisely set the dielectric sensing strip near the SRR within its fringing field.Closer the position of the sensor strip to the SRR, greater will be the sensitivity owing to the enhanced capacitive contribution to the resonance shift. Capacitive contribution at different regions of SRR is revealed by allowing the dielectric thin strip to gradually rotate through the near field of resonator with the axis of rotation passing through the centre of the ring structure. Fig. 2 shows the resonant frequency variation for 180^0 rotation with a dielectric strip of thickness $t = 1.27$ mm, width $w = 2.98$ mm and dielectric constant $\varepsilon = 3.7$. In the

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Direct Amplitude Modulation Technique using Metamaterial Broadside Coupled Split Ring Resonator (BCSRR) Structure

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Abstract – **This paper introduces a novel Amplitude Modulation (AM) technique employing metamaterial Broadside Coupled Split Ring Resonator (BCSRR). The carrier wave in the range of GHz frequency is directly modulated by the signal, using a specially designed BCSRR acting as a modulation sensor. The Modulated signal is transmitted through air and receiving it from a distance, the original signal is faithfully reproduced. Resonant frequency dependence of the spacing between the two rings of the BCSRR is employed for the modulation process and it is achieved by varying the spacing between the rings in accordance with the input signal. For the effective modulation, the carrier frequency is chosen at the midpoint of the linear section of the falling/rising slope of the absorption curve of the BCSRR unit. By selecting the BCSRR with narrow bandwidth, effective modulation is obtained even for weak signals. The chances of distortions in the AM wave due to over modulation are also addressed. The distinct characteristics of this modulation process, which does not require any associated electronic components, over conventional AM process, along with its manifold possibilities in the field of communication and instrumentation are also discussed.**

I. Introduction

Negative permeability metamaterial resonating structures are extensively used for different sensing applications in the field of science and technology [1]. Split Ring Resonator (SRR) and its manifold variants are the most explored components in the present day scenario [2]. Broadside Coupled Split Ring Resonator (BCSRR), if fabricated in a special way as mentioned by Sikha et al., offers an added advantage of wide band frequency tunability due to flexibility of changing the spacing between the rings of the BCSRR which are separately made on two pieces of same substrate material [3]. By employing this specially designed BCSRR unit, we are introducing a novel method for direct modulation of the amplitude of a microwave (carrier wave) using an audio frequency signal. Using a single BCSRR unit with one of its ring having capability to vibrate in response to the modulating signal, this direct amplitude modulation is achieved. Quite recently the possibility of modulating carrier using a signal related to mechanical vibration without employing any complicated electronic circuitry is reported [4]. This is the first experimental demonstration of a direct amplitude modulation (AM) process using a metamaterial structure, which may have promising applications in various fields of communication and instrumentation.

II. Experimental Setup of Amplitude Modulation (AM) Process

For experimental demonstration of this AM process, we have fabricated BCSRR rings on two FR4 circuit pieces with dielectric constant $\epsilon_r = 4.4$ and thickness $t = 0.8$ mm. The structural parameters of fabricated rings are given as inner radius $r = 2$ mm, split width $d = 0.2$ mm, width of the rings $c = 1$ mm. The resonant absorption curve of BCSRR with a spacing of 1 mm is obtained by setting it in between the transmitting and receiving probes of Vector Network Analyzer (VNA) and is shown in Fig. 1. The resonance frequency obtained is $f_0 = 4.72$ GHz. In order to obtain a faithful amplitude modulation we have to select a carrier frequency either on the rising or falling linear regions of the resonating curve. In the present case we have chosen the carrier frequency as 4.733 GHz which is on the mid point of the rising slope. For effectively modulating the carrier with signal, we need to

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Thin Film Metamaterial Split Ring Resonators at Microwave Frequencies

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Abstract – **In this paper we present a metamaterial Split Ring Resonator (SRR) made of thin films of nanometer thickness working in microwave frequencies. Since the thickness of nano-film used for fabricating metamaterial structures is below the skin depth, unique resonance behavior is observed in comparison to the resonance curves of its conventional counterpart made with thick films. At thickness less than skin depth, the film becomes resistive which in turn results in a wide band magnetic resonance. Silver thin film resonators of thickness 350 nm, 550 nm and 750 nm prepared on glass substrates using RF sputtering technique are used for the study. Absorption characteristics of the SRR and Broad-side Coupled SRR (BCSRR) are analyzed.**

I. Introduction

This era has witnessed intense research in thin film technologies to meet the need for miniaturization and quality enhancement of devices and gadgets. Metamaterials, owing to their exotic and unique characteristics, are extending their applications into diverse fields of technology searching for new horizons in the state of the art. In this paper, we report a new addition to the metamaterial resonators realized using thin films working in microwave frequencies.

The highly conducting metals like silver, gold and copper are mainly used for making SRRs so as to produce maximum magnetic resonance in the system[1, 2]. Here we discuss the resonance properties of metallic Split Ring Resonators (SRRs) made with silver thin films of thickness below the skin depth. The films are prepared by RF sputtering technique and the transmission spectra of this novel resonator is measured using Vector Network Analyzer (VNA) in the frequency range of 3 - 9 GHz.

II. Materials and Methods

The thin film silver SRRs of different thickness are prepared using RF magnetron sputtering technique. The glass substrate is cleaned using traditional cleaning techniques with ultrasonic bath and isopropyl alcohol. Then one side of the oven-dried slide is covered with high temperature resistant kapton tape. The resonator structure is then stenciled on the tape and is then fixed in the sample holder of the sputtering chamber facing the target. The silver target used is 50 mm diameter and 99.99% pure. The plasma was activated by a 13.56 MHz RF power of 25 W in argon pressure of 3×10^{-3} Torr with argon flow of 20 sccm. After coating, the mask (kapton tape) is carefully removed to get the ring resonators on the glass substrate. SRR and BCSRR structures of thickness 350 nm, 550 nm and 750 nm in square shape are prepared using this technique by varying the sputtering duration. Figure 1 gives the photograph of thin film SRR fabricated on a glass substrate. For the BCSRR, rings are fabricated on both sides of glass substrate of thickness 1.3 mm. The resonators are then placed between the monopole antennas connected to the transmitting and receiving probes of a Vector Network Analyzer (VNA) for the transmission measurement[3, 4].

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Metamaterial Split Ring Resonators made of Polyaniline - polytetrafluoroethylene at Microwave Frequencies

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Abstract **– We present the observance of magnetic resonance for the first time in Split Ring Resonators (SRRs) made of polyaniline - based conducting polymer and verify our experimental result through simulation. The magnetic resonance behavior of Closed Ring Resonator (CRR) and SRR of polyaniline - polytetrafluoroethylene (Pani - PTFE) are presented. The humidity sensitive conducting Pani - PTFE ring behaves like low loss conducting ring with wide-band magnetic resonance whereas the CRR does not show any resonant response as is expected. The results are analyzed using simulation studies for copper rings of similar dimensions. Magnetic resonance observed in Broad-side Coupled Split Ring Resonator (BCSRR) made of Pani - PTFE is also presented, highlighting its role in metamaterial based applications. Realization of metamaterial resonating structures using conducting polymers opens a new realm with immense possibilities in microwave and terahertz technologies.**

I. Introduction

Conducting polymers has emerged as one of the key areas of research during the last decade in the field of electromagnetic sensors and absorbers. Apart from using conducting polymers for slightly modifying the environmental conditions of the Split Ring Resonator (SRR), no other works are seen reported in the literature[1]. In this work, for the first time, we have fabricated the metamaterial based Broad-side Coupled Split Ring Resonator (BCSRR) structure using polyaniline - polytetrafluoroethylene (Pani - PTFE) conducting polymer and have analyzed its magnetic resonance behavior. This paper also addresses the observance of the widening of resonance curve in relation to the comparatively less conductivity of the proposed polymer with respect to the conventional metallic resonators. During the course of development of BCSRR, we have also analyzed the magnetic resonant behavior of Closed Ring Resonator (CRR) and SRR fabricated using conducting polymer. Experimental results are verified using high frequency simulation software and excellent agreement are observed.

II. Materials and Methods

For metallic resonators, the inductive contribution of the resonant frequency exclusively depends on the conduction current flowing through the ring. But since Pani - PTFE is a material having lower conductivity, the displacement current term which is a property of dielectric counterpart of the resonator should also be included in the calculation of the resonant frequency. The effective length of the resonating ring l_1 along with the resonant frequency Ω are given[2] by

$$l_1 = \ln[8R/r] - 7/4 \tag{1}$$

$$\Omega = \omega_o\sqrt{1+2\varepsilon k} \tag{2}$$

where ω_o is given by,

$$\omega_0^2 = 2c^2/\varepsilon^2 l_1 \tag{3}$$

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Enhancing the resolution in imaging using folded metamaterial split ring resonator structure at microwave frequencies

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Broadside coupled split ring resonator based multiband monopole patch antenna for wireless communication applications

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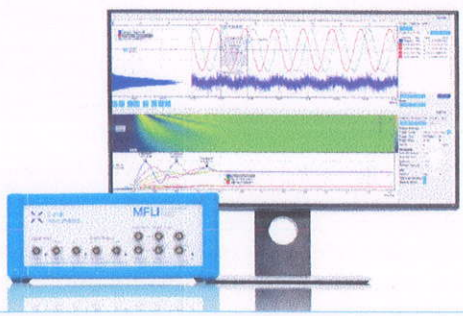

Scattering from artificial plasma cylinder using nonstandard FDTD

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Jovia Jose, Sikha K. Simon, Anju Sebastian, Sreedevi P. Chakyar, Joe Kizhakooden, Nees Paul, C. Bindu S. Umadevi, Jolly Andrews, and V. P. Joseph

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Microwave absorption properties of flexible zinc oxide sheet

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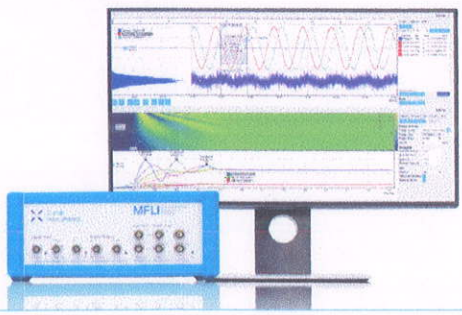

Non - destructive method for thickness measurement of dielectric films using metamaterial resonator

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Anju Sebastian, Denet Davis, Sikha K. Simon, Sreedevi P. Chakyar, Jovia Jose, Joe Kizhakooden, Nees Paul, C. Bindu, V. P. Joseph, and Jolly Andrews

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Frequency-dependent radiation properties of negative permittivity metamaterial reflector antenna

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Abstract

This paper reports a novel type of microwave reflector antenna that uses the frequency-dependent properties of an epsilon negative (ENG) metamaterial medium. The frequency-dependent characteristics of this artificial plasma medium is analyzed using the dispersive auxiliary differential equation finite difference time domain (ADE-FDTD) method by employing a Gaussian pulse and the results are verified experimentally using an artificial plasma medium fabricated by an array of thin conducting wires. The radiation pattern of plain and corner plasma reflector antennas modeled using Drude equations are obtained and are compared with a plasma reflector and conventional metallic reflector antennas. The results obtained for the plasma reflector antenna is experimentally verified using a 90° corner reflector antenna fabricated using wire medium. This new class of plasma antennas show marked variations in radiation pattern for frequencies above and below plasma frequency, which may find potential use in various frequency selective applications.

Keywords: negative permittivity, FDTD, dispersive medium, artificial plasma, reflector antenna, metamaterials

(Some figures may appear in colour only in the online journal)

1. Introduction

Metamaterials are artificially fabricated composites that exhibit unusual and unique electromagnetic properties due to negative values for permittivity, permeability and refractive index. This new class of materials was first proposed by Russian physicist Victor G. Veselago in 1968 [1]. In the beginning of this millennium, the proposed medium was realized in the form of a bulk medium by the periodic arrangement of structures having intrinsic negative values of permittivity and permeability. It was Pendry *et al* who, for the first time, realized both these negative permittivity and permeability materials using a periodic array of thin conducting wires and split ring resonators (SRRs) in 1996 and 1999 respectively [2, 3]. By combining both these structures in a specialized manner, the negative refractive index medium, also called the backward wave medium or left-handed medium (LHM), was actualized in the year 2000 by Smith and his colleagues for microwave frequencies [4]. Since the periodicity of the constituent metamolecules in the composite is very much less than the interacting wavelength, the medium exhibits homogeneous properties. Owing to their exotic characteristics such as the reversal of Snell's law, inverse Doppler effect, cloaking etc shown by this group of materials, immense research is going on in this field for a wide variety of applications for the support of the state of the art technology. Active research is taking place for realizing different variants of both single negative (SNG) and double negative (DNG) metamaterials for a wide variety of applications like

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Interaction of a Sine Wave with an Artificial Negative Permittivity Medium Using Nonstandard FDTD

Jose Jovia[1, 2], Sikha K. Simon[1], Joe Kizhakooden[1, 3], Anju Sebastian[1], Sreedevi P. Chakyar[1], Nees Paul[1, 3], Cherala Bindu[1], Jolly Andrews[1], and Vallikkavumkal P. Joseph[1, *]

Abstract—This paper presents the realization of Nonstandard Finite Difference Time Domain (NS-FDTD) analysis having high accuracy and low computational cost to a negative permittivity metamaterial wire medium for the first time. A sine wave of frequency less than that of plasma frequency of the medium which is in the shape of a slab reflector is allowed to interact after identifying the exact values of the required stability condition of the NS-FDTD. The electric field distribution around the plasma slab obtained for a particular excitation point using NS-FDTD and standard FDTD are demonstrated which show obvious advantages of this high accuracy algorithm. This novel technique may be further extended to various dispersive and metamaterial structures.

1. INTRODUCTION

Nonstandard Finite Difference Time Domain (NS-FDTD) analysis is a highly preferable algorithm owing to its manifold advantages like greater accuracy, enormous reduction in grid point, higher stability and lower number of iterations resulting in considerable lowering of computational cost than the standard FDTD. This new method introduced by Cole [1] showed that it is 10,000 times more accurate than the standard one where he demonstrated the electromagnetic wave scattering from a dielectric contrast using Maxwell's equations. This method achieves the same accuracy with λ/h (ratio of wavelength to grid space) $= 8$ which standard FDTD could only achieve with $\lambda/h = 1140$ which will result in a considerable decrease in iteration needed. NS-FDTD algorithm in terms of propagation equation is then developed and is used for analyzing Mie scattering of a dielectric disk [2]. This novel technique is also extended to study the cases with dispersive media and wide band frequency interactions [3–5]. By using an alternative approach, Jerez and Lara have explored NS-FDTD algorithm for addressing the possible instabilities in earlier works [6].

This highly accurate and computationally advantageous NS-FDTD method is successfully implemented for lossless cases [7]. NS-FDTD is also modeled in terms of conducting Maxwell's equations, and its successful implementation is predicted for a low loss medium [8]. In this paper we have implemented NS-FDTD method for a high loss medium and have used it for the first time for analyzing the interaction of the electromagnetic wave with a negative permittivity metamaterial medium. Epsilon Negative Medium (ENG), one of the constituent of metamaterial structures, is realized by making use of thin conducting wires and is allowed to interact with a sine wave with a frequency less than the characteristic plasma frequency of the medium. The advantages of NS-FDTD used to model the field distribution near the ENG slab are found by comparing the results with that of standard FDTD algorithm.

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Broadside coupled split ring resonator metamaterial structure for sensitive measurement of liquid concentrations

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Specially Designed Metamaterial Split Ring Resonator for High Resolution Imaging at Microwave Frequencies

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Abstract – **A promising novel topology specially designed with the aim to reduce the effective size of the Split Ring Resonator (SRR) for sensitive and high resolution imaging applications is proposed. This is achieved by modifying the conventional SRR by slightly raising the split region of the outer ring structure perpendicular to the plane of SRR. The proposed design topology is such that the localized field at the projected portion of the structure is isolated from the remaining portion of the SRR. After identifying the needed projection height of the split region of this specially designed scanning probe, objects with dimensions very much less than operating wavelength is scanned and identified, which will not be possible by using a normal SRR. The experimental results are verified using high frequency stimulation software to authenticate the results of this newly designed sensor which may find applications in enhancing the sensitiveness of all types of SRR based sensors.**

I. Introduction

Split Ring Resonators (SRR), the negative permeability part of metamaterial, are widely used in various sensor applications by making use of their capacitive and inductive contributions along with their near field variations [1]. In order to enhance the sensitiveness of the resonator, different techniques like inclusion of external passive and active components are suggested by various researchers [2]. Different types of sensors are seen in literature which requires additional and relatively complicated circuitary along with SRR for specific sensor applications [3]. In this paper, we have proposed a simple and novel design to modify the conventional SRR by slightly raising the split gap region of the outer ring and there by isolating the localized field at the sensing region for better precision. By using this high sensitive sensor, we have scanned an arrangement of closely spaced thin dielectric strips and have reproduced the images faithfully with better resolution and the experimental results were verified using high frequency simulation method.

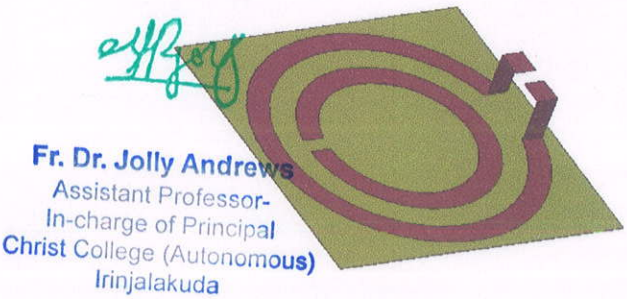

Fig. 1: Novel SRR design with projected outer split gap region.

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ORIGINAL PAPER

Broadside Coupled Split Ring Resonator as a Sensitive Tunable Sensor for Efficient Detection of Mechanical Vibrations

Sikha K. Simon[1] · Sreedevi P. Chakyar[1] · Anju Sebastian[1] · Jovia Jose[1,2] · Jolly Andrews[1] · V. P. Joseph[1]

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Abstract
This paper explores the possibility of the precise determination of mechanical vibrations using metamaterial split ring resonator (SRR) structure. The amplitude of the interacting electromagnetic wave in the range of GHz frequency is directly varied in accordance with the amplitude of mechanical vibration, using a Broadside Coupled SRR (BCSRR) acting as a vibration sensor. Dependence of the spacing between the two rings on the resonance frequency of the BCSRR is used for the detection of vibration and it is achieved by allowing the spacing to change in accordance with the amplitude of mechanical vibration. For the effective sensing of mechanical vibration, the electromagnetic wave frequency is chosen at the center of the linear portion of the rising or the falling slope of the resonant curve of the BCSRR. By properly choosing the parameters of the BCSRR along with the effective tuning of the operating frequency, it is possible to detect even very weak vibrations. The chances of various distortions in the detected vibration waveform in connection with selection of the operating frequency and intensity of vibrations are also analyzed. The qualitative formulation of the detection process along with its experimental verification is presented. This novel method may find applications in the detection of mechanical vibrations caused by various man made and natural sources and may find manifold possibilities in the field of communication and instrumentation.

Keywords Metamaterials · Split ring resonator · Vibration sensor · BCSRR

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FDTD Analysis of the Interaction of a Gaussian Pulse with Negative Permittivity Metamaterial Slab

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***Abstract*—The interaction of a Gaussian pulse with a negative permittivity metamaterial slab is presented. The results of this numerical study predict the propagation behavior of electromagnetic wave in presence of the slab. To perform this analysis the Auxiliary Differential Equation Finite Difference Time Domain (ADE-FDTD) analysis for a dispersive medium using Drude model is used. The negative permittivity plasma medium is modeled using effective medium theory. A Gaussian pulse of wide frequency bandwidth is used for the analysis. The field distributions for frequencies above and below the plasma frequency are investigated. The study reveals the frequency selective properties of the negative permittivity slab in relation to the reflection and transmission characteristics.**

***Index Terms*—Dispersive medium, Drude model, FDTD, Gaussian pulse, Metamaterials, Negative Permittivity.**

I. Introduction

Metamaterials are engineered periodic structures having homogeneous properties for the interacting waves. These materials show unusual electromagnetic properties not observed with normal materials. The unusual behaviors of these materials are due to its negative values of permeability μ, permittivity ϵ and index of refraction n. Periodic structures having negative μ and ϵ are mixed together to get negative n structure [1]–[4]. Finite Difference Time Domain (FDTD) method offers a simple and straight forward way for modeling complicated periodic structures [5]–[9] like metamaterial and photonic band-gap structures. Since these artificial plasma media consists of periodic distribution of conducting elements, it is dispersive [10]–[13]. There are two possibilities for the modeling of this medium in FDTD. One is the actual insertion of conducting elements periodically in the computational domain by assigning high electron density for the selected cells and the other is by considering the medium in terms of effective medium properties. Mainly three methods are used for the analysis of a dispersive medium using FDTD [5]. They are Auxiliary differential Equation method (ADE), Recursive Convolution method (RC), and the Z-transform method.

The electromagnetic wave propagation in presence of a negative permittivity slab using effective medium theory is preformed in this study. A Gaussian pulse of wide frequency bandwidth is used to illuminate the computational domain. The signal strengths in front and back of the negative permittivity slab for different frequencies are analyzed.

II. Formulation of the Problem

The problem is simulated in 2-dimensional dispersive FDTD space using effective medium theory. The model equations involved in 2D-ADE-FDTD are used. In this study Drude model is used for modeling frequency dependent permittivity slab. According to this model, the relative permittivity $\epsilon_r(\omega)$ and relative permeability $\mu_r(\omega)$ are as follows,

$$\epsilon_r(\omega) = 1 - \frac{\omega_{ep}^2}{\omega^2 - \omega_{e0}^2 - i\gamma_e\omega} \tag{1}$$

$$\mu_r(\omega) = 1 - \frac{\omega_{mp}^2}{\omega^2 - \omega_{m0}^2 - i\gamma_m\omega} \tag{2}$$

where ω_{ep} is the electric plasma frequency and ω_{e0} is the low frequency edge of the electric forbidden band. γ_e is the electric damping factor. ω_{mp}, ω_{m0} and γ_m are the corresponding factors for the magnetic field. For a TE wave with field components E_z, H_x and H_y, Maxwells curl equations in component form are given by,

$$\frac{\partial D_z}{\partial t} = \frac{\partial H_y}{\partial x} - \frac{\partial H_x}{\partial y} \tag{3}$$

$$\frac{\partial B_x}{\partial t} = -\frac{\partial E_z}{\partial y} \tag{4}$$

and

$$\frac{\partial B_y}{\partial t} = \frac{\partial E_z}{\partial x} \tag{5}$$

The expressions for D and B in terms of the components of electric and magnetic fields E_z, H_x and H_y can be found out using Maxwells equations and Drude model as [7],

$$D_z = \epsilon_0\left(1 - \frac{\omega_{ep}^2}{\omega^2 - \omega_{e0}^2 - i\gamma_e\omega}\right)E_z \tag{6}$$

$$B_x = \mu_0\left(1 - \frac{\omega_{mp}^2}{\omega^2 - \omega_{m0}^2 - i\gamma_m\omega}\right)H_x \tag{7}$$

$$B_y = \mu_0\left(1 - \frac{\omega_{mp}^2}{\omega^2 - \omega_{m0}^2 - i\gamma_m\omega}\right)H_y \tag{8}$$

Equations used for modeling of metamaterials are obtained by simplifying and converting to time domain by replacing $i\omega$ by $\partial/\partial t$ and applying the second order FDTD discretization to the Eqn. 6 - Eqn. 8.

The computational domain is divided into three regions and a negative permittivity slab of thickness d is defined in it as

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RESEARCH ARTICLE - PHYSICS

Humidity Sensitive Flexible Microwave Absorbing Sheet Using Polyaniline–Polytetrafluoroethylene Composite

Nees Paul[1,2] · Sreedevi P. Chakyar[1] · K. S. Umadevi[3,4] · Simon K. Sikha[1] · Joe Kizhakooden[1,2] · Jolly Andrews[1] · V. P. Joseph[1]

Received: 9 March 2018 / Accepted: 7 June 2018

Abstract
Pelletized or powdered polyaniline composite, a potential candidate for microwave absorbers, was synthesized in the sheet form for the first time, and its absorption characteristics along with structural, electrical and mechanical properties are presented. Enhanced microwave absorption behavior of this novel, thin, flexible, lightweight sheet in hydrous environment was analyzed for various humidity-dependent sensor and electromagnetic applications. The preparation method of protonated chlorine-doped polyaniline (PANI), and its synthesis in the sheet form using polytetrafluoroethylene (PTFE) are discussed. The surface and structural morphology were characterized by XRD and SEM, which reveal the granular, macro-porous and polycrystalline structure of the material. A transmission–reflection-based waveguide technique was used for obtaining the permittivity of sheets in the frequency range of 3–9 GHz by employing the Nicholson–Ross algorithm, and it was verified by cavity perturbation method. The temperature stability of the PANI–PTFE conducting sheet was checked using four-probe method. Conductivity enhancement of the sheet in hydrous environment was studied using a humidity chamber. The microwave absorption studies at various humidity conditions were carried out using waveguide method which also illustrated its potentiality as a humidity sensor. The mechanical strength of the proposed conducting polymer sheet was tested by standard load–extension procedure. To make this PANI–PTFE polymer material suitable for anechoic chamber-like applications, it was impregnated in polyurethane foam and its humidity-related microwave absorption studies were carried out using free space method.

Keywords Flexible composites · Polyaniline · Microwave absorber · Humidity sensor

1 Introduction

Microwave absorbers were of great importance even during the initial stages of research and development of electromagnetic devices and diversification of their applications. Nowadays, the relevance and the importance of these absorbers have increased manifold due to the exponential increase in the types and quality of electromagnetic gadgets. Owing to the high density of electromagnetic (EM) users added care has to be taken for avoiding the issues related to electromagnetic interference (EMI), which is of prime importance in communication systems and in various industrial, scientific, and medical (ISM) applications. Another major concern is health hazard confusions related to overexposure of microwave radiations which demand some sort of protective measures for the safe use of these advanced technologies. Such scenario demands intense research for the development of novel type of microwave absorbers having added advantages over conventional types in order to address the emerging issues related to state-of-the-art microwave technology.

Microwave absorbers are broadly classified based on the principle of electromagnetic absorption caused by conductivity and electric/magnetic losses owing to its hysteresis nature. The boundary mismatch, a major concern in connection with any type of microwave absorbers can be tailored

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Nonstandard FDTD Realization of Radiation Behaviour of Epsilon Negative Metamaterial Corner Reflector Antenna

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***Abstract* – The radiation behaviour of a corner reflector antenna designed using epsilon negative (ENG) artificial wire medium is realized using nonstandard Finite Difference Time Domain (NS-FDTD) method and the results are compared with standard FDTD algorithm. High accuracy NS-FDTD algorithm which requires less iteration for convergence is for the first time implemented for metamaterial corner reflector antenna. This is achieved by extending this powerful algorithm by addressing the stability related issues in conducting media and the proposed work may find potential applications in the simulation studies of dispersive and metamaterial designs.**

I. Introduction

One of the major issues for the implementation of standard Finite Difference Time Domain (FDTD) method in structural designs related to matematerials is the requirement of large domain space which, in turn, requires high computational cost. A modified form of FDTD, named as nonstandard Finite Difference Time Domain (NS-FDTD), has proved to be highly effective in many aspects like accuracy and speed and it achieves the same result with λ/h (ratio of wavelength to grid space) = 8 which the standard one can only attain with $\lambda/h = 1140$ [1]. NS-FDTD has already been successfully implemented for dielectric medium [2] and for structures having low conductivity. Quite recently, this powerful algorithm which considerably enhances the computational efficiency is reported for a plane conducting plasma medium [3]. In this work, for the first time, we have successfully employed NS-FDTD method to analyze the radiation behaviour of a corner reflector antenna designed using conducting wires in the form of an artificial Epsilon Negative (ENG) plasma medium by considering the stability issues related to the convergence of the function used [4]. The already predicted accuracy claims of NS-FDTD is achieved in a metamedium and the results are compared with standard FDTD.

II. Formulation of the Problem and Design of the Structure

For employing NS-FDTD, we have incorporated wave equation method instead of using Maxwell's equations. The absorbing wave equation given by Cole [4] is used for designing the ENG medium which made by periodic array of thin conducting wires for the proposed corner reflector antenna and is given by

$$E_z(\mathbf{x}, t+\Delta t) = E_z(\mathbf{x}, t) + (\frac{1-a}{1+a})[E_z(\mathbf{x}, t) - E_z(\mathbf{x}, t-\Delta t))] + (\frac{v^2}{1+a})D_o^2 E_z(\mathbf{x}, t) \quad (1)$$

where v^2 and a are given by

$$v^2 = \frac{1}{\sin^2(\frac{kh}{2})}[\sin^2(\frac{\omega\Delta t}{2})\cosh^2(\frac{\alpha\Delta t}{2}) + \sinh^2(\frac{\alpha\Delta t}{2})\cos^2(\frac{\omega\Delta t}{2}) + \frac{1}{2}\tanh(\alpha\Delta t)\sinh(\alpha\Delta t)\cos(\omega\Delta t)] \quad (2)$$

$$a = \tanh(\alpha\Delta t) \quad (3)$$

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NOTE

A CHECKLIST OF SPIDER FAUNA OF RAJASTHAN, INDIA

Neisseril Anirudhan Kashmeera & Ambalaparambil Vasu Sudhikumar

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Zoological Studies

Open Access

Effect of Kleptoparasitic Ants on the Foraging Behavior of a Social Spider (*Stegodyphus sarasinorum* Karsch, 1891)

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The term kleptoparasitism is used to describe the stealing of nest material or prey of one animal by another. Foraging and food handling behaviors of social spiders increase the vulnerability to kleptoparasitism. Kleptoparasites of the social spider *Stegodyphus sarasinorum* Karsch 1891 were identified based on the observations done in the field. Four species of spiders and two species of ants were observed as kleptoparasites and collected from the nest and webs of this social spider. The ants were found to be the most dominant among them. The influence of a facultative kleptoparasitic ant, *Oecophylla smaragdina* on the foraging behavior of *S. sarasinorum* was studied in laboratory conditions. The experiments suggested that the web building behavior of *S. sarasinorum* was influenced by the exposure to ants. However, exposure to ants caused no significant effect in the prey capture, handling time of prey and prey ingestion behaviors of the spider.

Key words: Social spider, Ecology, Kleptoparasites, Ants, Prey capturing behavior.

BACKGROUND

Kleptoparasitism is a type of feeding behavior, in which one animal steals the food or prey captured by another animal. Kleptoparasites feed on prey which could not be obtained by themselves without time and effort. There are chances for the kleptoparasites to be injured by the host organism (one being stolen from) when the latter defends its prey. Kleptoparasitic behavior is seen in a diverse array of taxa including marine invertebrates (Zamora and Gomez 1996; Morrissette and Himmelman 2000), spiders and insects (Higgins and Buskirk 1988; Field 1992), birds (Brockmann and Barnard 1979), large carnivores (Packer and Ruttan 1988) and primates (Di Bitetti and Janson 2001).

Susceptibility to kleptoparasitism is affected by various characteristics of the organism's behaviors include foraging and food-handling behaviors (Brockman and Barnard 1979; Giraldeau and Caraco 2000). Kleptoparasites depend on high-quality food and it is available to them due to prolonged handling (Giraldeau and Caraco 2000). Lastly, the more conspicuous the hunting and food handling behaviors, the easier it is for the potential thieves to identify the opportunities for exploitation.

Among spiders, web-building spiders are frequent targets of kleptoparasites (Vollrath 1987). Web-building spiders are relatively sedentary, sit-and-wait type of predators and capture prey that is often larger than themselves and that takes time to consume. They usually store many prey items in the web or nest for future consumption (Champion de Crespigny et al. 2001). Social spiders built large sized web and capture large sized prey cooperatively. Due to these behaviors, social spiders are also an attractive resource for kleptoparasites.

A few species of spiders act as kleptoparasites along with insects like some scorpionflies (Thornhill 1975) and ants (Henschel and Lubin 1992; Pasquet et

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Arthropoda Selecta 28(1): 125–130

A new spider species of the genus *Cocalus* C.L. Koch, 1846 (Araneae: Salticidae: Spartaeinae) from Western Ghats of India

Новый вид пауков из рода *Cocalus* C.L. Koch, 1846 (Araneae: Salticidae: Spartaeinae) из Западных Гат Индии

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KEY WORDS: Aranei, jumping spider, description, distribution map, Kerala, Wayanad Wildlife Sanctuary.

КЛЮЧЕВЫК СЛОВА: Aranei, паук-скакунчик, описание, карта распространения, Керала, Уэйнадский заповедник.

ABSTRACT. A new species of the jumping spider genus *Cocalus* C.L. Koch, 1846 — *C. lacinia* sp.n. (♂♀) — is diagnosed and described from the Wayanad Wildlife Sanctuary, Western Ghats, Kerala, India. A detailed morphological description, diagnostic features and illustrations of the copulatory organs of both sexes are given. The current distribution of the genus in India is mapped as well.

How to cite this article: Sudhin P.P., Nafin K.S., Sumesh N.V., Sudhikumar A.V. 2019. A new spider species of the genus *Cocalus* C.L. Koch, 1846 (Araneae: Salticidae: Spartaeinae) from Western Ghats of India // Arthropoda Selecta. Vol.28. No.1. P.125–130. doi: 10.15298/arthsel. 28.1.10

РЕЗЮМЕ. Диагностирован и описан новый вид пауков-скакунчиков из рода *Cocalus* C.L. Koch, 1846 из Уэйнадского заповедника, Западные Гаты, Керала, Индия: *C. lacinia* sp.n. (♂♀). Приведены детальное морфологическое описание, диагностические признаки и иллюстрации копулятивных органов обоих полов. Также прокартировано современное распространение рода в Индии.

Introduction

The Spartaeine genus *Cocalus* C.L. Koch, 1846 is a poorly studied salticid group confined to the Oriental and Australian Regions. The genus is characterized by the presence of an elevation in the posterior ocular quadrangle in both sexes and the sinuous finger-like projection resting on the male palpal retrolateral tibial apophysis [Wanless, 1981]. Currently, the genus consists of five valid species, of which the only one, *Cocalus murinus* Simon, 1899, has been reported from the Indian subcontinent [Roy *et al.*, 2016; WSC, 2018]. In the present paper, we aim to describe and illustrate a new species, *Cocalus lacinia* sp.n. (♂♀), collected from the Wayanad Wildlife Sanctuary lying in Western Ghats in Kerala, one of the biodiversity hotspots of the world [Myers *et al.*, 2000]. The current geographic distribution of the genus in India is mapped as well.

Materials and methods

Field photos were taken with a Canon EOS 5D Mark-III using Canon EF 100 mm f/2.8 Macro USM Lens, Canon MP-E 65 mm 1–5x Macro Lens and Canon MT-24EX Macro Twin Lite Flash. Spiders were hand-collected, and the specimens were stored in 70% ethanol. A morphological examination was undertaken under a Leica M205 C stereomicroscope. The microphotographic images were taken by means of Leica DMC4500 digital camera attached to Leica M205 C stereomicroscope, with the software package Leica Application Suite (LAS), version 4.3.0. LAS montage facility. All measurements are in mm. Measurement data for palps and legs are as follows: total length [femur, patella, tibia, metatarsus (except palp), tarsus]. The studied specimens are deposited in the reference collection at the Centre for Animal Taxonomy and Ecology (CATE), Department of Zoology, Christ College (Autonomous), Irinjalakuda, Kerala, India.

Abbreviations used in the text and figure plates: ALE — anterior lateral eyes, AME — anterior median eyes, co — copulatory opening, do — dorsal, e — embolus, ec — extension of cymbium, fd — fertilization duct, pl — prolateral, PLE — posterior lateral eyes, PME — posterior median eyes, plv — prolateral ventral, rl — retrolateral, RTA — retrolateral tibial apophysis, rlv — retrolateral ventral, t — tegulum, v — ventral, VTA — ventral tibial apophysis, vto — ventral tibial outgrowt. The terminology follows Reiskind [1969]; that for leg spination follows the format by Bosselaers & Jocque [2000].

Is cooperation in prey capture flexible in the Indian social spider Stegodyphus sarasinorum?

Authors: Ovatt Mohanan Drisya-Mohan, Neisseril Anirudhan Kashmeera, and Ambalaparambil Vasu Sudhikumar

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Two new species of the tribe Ballini Banks, 1892 from India (Araneae: Salticidae)

Два новых вида трибы Ballini Banks, 1892 из Индии (Araneae: Salticidae)

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KEY WORDS. Aranei, jumping spiders, taxonomy, diagnostic characters, distribution.

КЛЮЧЕВЫЕ СЛОВА. Aranei, пауки-скакунчики, таксономия, диагностические признаки, распространение.

ABSTRACT. The genus *Indomarengo* Benjamin, 2004 is reported from India for the first time. Two new species of the genera *Indomarengo* and *Marengo* Peckham et Peckham, 1892 are described. Detailed morphological descriptions, diagnoses and illustrations for both species and SEM images for the new *Indomarengo* species are provided. Several new morphological characters of the genus *Indomarengo* are discussed. Collecting localities of both new species are mapped.

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РЕЗЮМЕ. Род *Indomarengo* Benjamin, 2004 впервые отмечен из Индии. Описаны два новых вида из родов *Indomarengo* и *Marengo* Peckham et Peckham, 1892. Даны детальные морфологические описания, диагнозы и рисунки для обоих видов и SEM изображения для вида *Indomarengo*. Обсуждаются несколько новых морфологических признаков для рода *Indomarengo*. Точки находок обоих видов прокартированы.

Introduction

According to Maddison [2015], the jumping spider family Salticidae consists of 588 genera in seven subfamilies, 30 tribes and 13 subtribes. The subfamily Marpissoida Maddison et Hedin, 2003 includes three tribes: Ballini Banks, 1892, Tisanibini Maddison, 2015 and Dendryphantini Menge, 1879 [Maddison, 2015].

Jumping spiders of the tribe Ballini are distributed in Asia, Africa, Europe and Australia, accounting for 84 species in 15 genera [Maddison, 2015; WSC, 2019], but two more genera — *Ligdus* Thorell, 1895 and *Homalattus* White, 1841, which are currently listed as *incertae sedis* — could also be members of the Ballini [Maddison, 2015]. Asia seems to be the most diverse continent for the Ballini, whereas Europe (one genus) and Australia (two genera) are least diverse [WSC, 2019].

Based on morphological characters, Benjamin [2004, 2006] revised the Ballini and erected two Asian genera (*Indomarengo* Benjamin, 2004 and *Leikung* Benjamin, 2004) and an African one (*Afromarengo* Benjamin, 2004). *Indomarengo* consists of three species: *I. chandra* Benjamin, 2004, *I. sarawakensis* Benjamin, 2004 and *I. thomsoni* (Wanless, 1978) distributed in SE Asia [WSC, 2019]. In the present paper we aim (1) to describe a new *Indomarengo* species from India, hence recording the genus from India for the first time, and (2) to describe a new *Marengo* species from India. A distribution map for both species is also provided.

Materials and Methods

Fresh material was hand-collected from foliage. Specimens were studied under a LEICA S8AP0 stereomicroscope. All measurements are in mm and were made with the aid of ocular micrometer. Measurements of carapace and abdomen length and height were taken at the middle part of each body part. Lengths of palp and leg segments are given as follows: total (femur, patella, tibia, metatarsus (except palp), tarsus). Spine positions are as follows: prolateral,

Arthropoda Selecta 28(3): 435–444

Two new species of the genus *Marengo* Peckham et Peckham, 1892 (Araneae: Salticidae) from Western Ghats of India

Два новых вида из рода *Marengo* Peckham et Peckham, 1892 (Araneae: Salticidae) из Западных Гат Индии

Puthoor Pattammal Sudhin[1]*, Karunnappilli Shamsudheen Nafin[1,2], Suresh P. Benjamin[3], Ambalaparambil Vasu Sudhikumar[1,4]

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KEY WORDS: Aranei, jumping spiders, distribution, Kerala, taxonomy, Wayanad Wildlife Sanctuary.

КЛЮЧЕВЫЕ СЛОВА: Aranei, пауки-скакунчики, распространение, Керала, таксономия, заповедник Вэйнад.

ABSTRACT. Two new jumping spiders of the genus *Marengo* Peckham et Peckham, 1892 from the Wayanad Wildlife Sanctuary, Western Ghats, Kerala, India — *M. zebra* sp.n. (♂♀) and *M. batheryensis* sp.n. (♂♀) — are diagnosed, described and illustrated. Distribution of all the Indian *Marengo* species is mapped as well.

How to cite this article: Sudhin P.P., Nafin K.S., Benjamin S.P., Sudhikumar A.V. 2019. Two new species of the genus *Marengo* Peckham et Peckham, 1892 (Araneae: Salticidae) from Western Ghats of India // Arthropoda Selecta. Vol.28. No.3. P.435–444. doi: 10.15298/arthsel. 28.3.08

РЕЗЮМЕ. Два вида пауков-скакунчиков из рода *Marengo* Peckham et Peckham, 1892 из заповедника Вэйнад, Западные Гнаты, Керала, Индия — *M. zebra* sp.n. (♂♀) и *M. batheryensis* sp.n. (♂♀) — диагностированы, описаны и иллюстрированы. Распространение всех индийских видов *Marengo* также прокартировано.

Introduction

The genus *Marengo* was established by Peckham & Peckham [1892] on the basis of the generotype *Marengo crassipes* Peckham et Peckham, 1892 from Sri Lanka. Currently, the genus contains six valid species, of which five were described from Sri Lanka and one from Thailand [WSC, 2019]. Gupta & Siliwal [2012] reported on a single male of *M. crassipes* from the states of Uttarakhand, which to date has been the only record of Marengo from India. In the present paper, we have described two new species, *M. zebra* and *M. batheryensis*, from the Wayanad Wildlife Sanctuary lying in the southern Western Ghats region, Kerala, India. The current geographic distribution of the genus in India is mapped as well.

Materials and methods

Spiders were hand-collected and preserved in 70% ethanol. A morphological examination was undertaken under a Leica M205 C stereomicroscope. The microphotographic images were taken by means of Leica DMC4500 digital camera attached to Leica M205 C stereomicroscope, with the software package Leica Application Suite (LAS), version 4.3.0. LAS montage facility. All measurements are in mm. Measurement data for palps and legs are as follows: total length [femur, patella, tibia, metatarsus (except palp), tarsus]. The studied specimens are deposited in the reference collection at the Centre for Animal Taxonomy and Ecology (CATE), Department of Zoology, Christ College (Autonomous), Irinjalakuda, Kerala, India.

Abbreviations used in the text and figures: ALE — anterior lateral eyes, AME — anterior median eyes, cd — copulatory duct, co — copulatory opening, der — damaged embolic region, do — dorsal, e — embolus, ec — embolic coil, fd — fertilization duct, pl — prolateral, PLE — posterior lateral eyes, PME — posterior median eyes, plv — prolateral ventral, rl — retrolateral, RTA — retrolateral tibial apophysis, rlv — retrolateral ventral, s — spermathecae, sd — sperm duct, ts — translucent septum, t — tegulum, v — ventral. The terminology follows Reiskind [1969]; that for leg spination follows the format by Bossellaers & Jocqué [2000].

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Impact of *Parawixia dehaani* (Doleschall, 1859) on the population dynamics of the kleptoparasitic spider *Argyrodes flavescens* O. Pickard-Cambridge, 1880 – A case study

Impatto di *Parawixia dehaani* (Doleschall, 1859) nella dinamica delle popolazioni del ragno cleptoparassita *Argyrodes flavescens* O. Pickard-Cambridge, 1880 – Un caso di studio

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Abstract

Argyrodes flavescens O. Pickard-Cambridge 1880 is a kleptoparasite; normally both sexes together inhabit in the webs of large web building spiders. We also investigated the factors that influence the relationship between *Argyrodes flavescens* and host spider *Parawixia dehaani* (Doleschall, 1859). Field surveys were conducted to examine how the size of the host and its web affect the abundance of *Argyrodes flavescens* and the impact of *Parawixia dehaani* to attract the kleptoparasite *Argyrodes flavescens* to its webs. Our data on the kleptoparasitic behavior of *A. flavescens* on the webs of orb web weaving spider *P. dehaani* show that larger webs spun by larger *P. dehaani* accommodated more *A. flavescens* and comparatively small webs hosted less species.

Key-words: *Argyrodes flavescens*, cosmopolitan, host, kleptoparasite, *Parawixia dehaani*.

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Two new species of the jumping spiders (Araneae: Salticidae) from the genera *Epeus* Peckham et Peckham, 1886 and *Piranthus* Thorell, 1895 from India

Два новых вида пауков-скакунчиков (Araneae: Salticidae) из родов *Epeus* Peckham et Peckham, 1886 и *Piranthus* Thorell, 1895 из Индии

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KEY WORDS: Aranei, descriptions, Pathiramanal Island, Ramsar site, taxonomy, Western Ghats.

КЛЮЧЕВЫЕ СЛОВА: Aranei, описания, остров Патираманал, локалитет Рамсар, таксономия, Западные Гаты.

ABSTRACT. Two new species of the jumping spiders from different parts of India, collected from different expeditions, are diagnosed and described: viz., *Epeus triangulopalpis* sp.n. (♂♀) and *Piranthus planolancis* sp.n. (♀). A detailed account of somatic and genitalic characters, digital images, B/W illustrations and live photos are given. A map with collecting localities of these species is provided as well.

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РЕЗЮМЕ. Два вида пауков-скакунчиков из различных регионов Индии, собранных в различных экспедициях, диагностированы и описаны: а именно, *Epeus triangulopalpis* sp.n. (♂♀) и *Piranthus planolancis* sp.n. (♀). Приводятся детальное описание соматических и генитальных признаков, черно-белые иллюстрации, цифровые фотографии и фотографии из природы. Также приводится карта с точками находов новых видов.

Introduction

During the survey of Indian spiders, we have discovered two new species of the genera *Epeus* Peckham et Peckham, 1886 and *Piranthus* Thorell, 1895. Species of the Oriental genus *Epeus* have the flattened and elongated cymbium in the male palp, with a retrolateral basal apophysis pointing postero-ventrad; the tegulum with a tongue-like process; the filiform embolus; and the epigyne with the long copulatory ducts having several loops [Meng *et al*. 2015]. *Epeus* currently comprises 15 valid species, of which the majority (nine species) have been reported from different parts of the Oriental Region. The remaining *Epeus* species extend their ranges to India, China and Nepal. The genus *Piranthus* Thorell, 1895 is represented by two species known from India and Myanmar [WSC, 2018], both remain known from the females only. Among them, *P. casteti* Simon, 1900 seems to be endemic to India, whereas *P. decorus* Thorell, 1895 was originally described from Myanmar but then had also been recorded from India [Caleb, Sanap, 2017]. Yet, Caleb & Sanap [2017] provided digital images of a general appearance of an unknown *Piranthus* male, while no male of the described *Piranthus* species has been recorded/described yet.

In the present paper, we aim to describe two new species of *Epeus* and *Piranthus* based on newly collected materials from the coastal plains of Western Ghats and an estuarine island of southern India. Photos of live specimens of both species (Figs 1–6), as well as a map with collecting localities of the *Epeus* species in India and all the records of *Piranthus* are also provided.

Material and methods

The specimens were studied under a LEICA S8AP0 stereomicroscope. All measurements are in mm. Palp and leg segment lengths are given as follows: (femur, patella, tibia, metatarsus (except palp), and tarsus) total. The micro-

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Effect of Apoptosis on Human Breast Cancer Cell Line (MCF-7 and MDA-MB231) Using *Curcuma longa*

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Abstract

Cancer cells usually have increased cell proliferation; have ability to survive in unique environment and decreased apoptosis. Decreased apoptosis gives the cancer cells a survival advantage. All cells showed a small base line apoptotic level. Treatment of cancer cells with curcumin significantly increased apoptosis by Caspase 3/7 assay, Annexin IV assay and tunel assay suggesting that both early and late apoptotic events are triggered by curcumin. Increased apoptosis by curcumin may be used to kill the cancer cells and thereby help in treatment of cancer. The overall results obtained in the study point out that the active molecule present in *Curcuma longa* have considerable consequence on the survival of human breast cancer cell lines. Finally, it is concluded that curcuminoids are a group of phenolic compounds isolated from the rhizome of *Curcuma longa* has various pharmacological properties. They exhibit growth inhibitory effects on a broad range of tumors and act as potent anticancer, anti-inflammatory and analgesic agent and more research should be carried out and this data should be made accessible for both health care providers and patients for safe anticancer treatments.

Keywords
Curcumin, cancer, apoptosis, therapy.

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INTRODUCTION

Curcumin is the medicinal extract of a rhizomatous herbaceous perennial plant of the ginger family, Zingiberaceae bearing many rhizomes on its root system which are the source of its culinary spice known as turmeric. The plant belongs to the genus: Curcuma and species: *longa*. Its scientific name is *Curcuma longa* Linnaeus and it is native in southeast India. It has gained access to many other parts of the world as an exotic variety. Curcumin (diferuloylmethane) is a polyphenol derived from the rhizome of the turmeric plant, *Curcuma longa*. It is a non-nutritive food chemical used as a flavouring, coloring agent and as a food preservative. It has been consumed for centuries as a dietary spice regularly at a reasonable amount by people in Asian countries. Modern therapist attention started to revolve round the turmeric species for its wide use in traditional medicine as a effective antioxidant, anti-inflammatory, analgesic and anticancer agent.

Effect of Apoptosis on Human Prostate Cancer Cells (PC3, DU145 AND LNCaP) Using *Curcumin longa*

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Abstract

Cancer cells usually have increased cell proliferation; have ability to survive in unique environment and decreased apoptosis. Decreased apoptosis gives the cancer cells a survival advantage. All cells showed a small base line apoptotic level. Treatment of cancer cells with curcumin significantly increased apoptosis by Caspase 3/7 assay, Annexin IV assay and tunel assay suggesting that both early and late apoptotic events are triggered by curcumin. Increased apoptosis by curcumin may be used to kill the cancer cells and thereby help in treatment of cancer. The overall results obtained in the study point out that the active molecule present in *Curcuma longa* have considerable consequence on the survival of human prostate cancer cell lines. Finally, it is concluded that curcuminoids are a group of phenolic compounds isolated from the rhizome of *Curcuma longa* has various pharmacological properties. They exhibit growth inhibitory effects on a broad range of tumors and act as potent anticancer, anti-inflammatory and analgesic agent and more research should be carried out and this data should be made accessible for both health care providers and patients for safe anticancer treatments.

Keywords - Curcumin, cancer, apoptosis, therapy.

INTRODUCTION

Curcumin is the medicinal extract of a rhizomatous herbaceous perennial plant of the ginger family, Zingiberaceae bearing many rhizomes on its root system which are the source of its culinary spice known as turmeric. The plant belongs to the genus: Curcuma and species: *longa*. Its scientific name is *Curcuma longa* Linnaeus and it is native in southeast India. It has gained access to many other parts of the world as an exotic variety. Curcumin (diferuloylmethane) is a polyphenol derived from the rhizome of the turmeric plant, *Curcuma longa*. It is a non-nutritive food chemical used as a flavouring, coloring agent and as a food preservative. It has been consumed for centuries as a dietary spice regularly at a reasonable amount by people in Asian countries. Modern therapist attention started to revolve round the turmeric species for its wide use in traditional medicine as a effective antioxidant, anti-inflammatory, analgesic and anticancer agent. Several pilot studies showing suppression in cellular transformation, proliferation, invasion, angiogenesis, and metastasis have further kindled their interest. Being a blood-brain barrier permeable substance exhibiting a diverse range of actions including free radical scavenging activity *in vitro* and *invivo* with cardio and neuro-protective effects added strength to the world-wide attention.

Cancer is an abnormal growth and proliferation of cells. It is a fearsome disease because the patient suffers pain, disfigurement and loss of many physiological processes ending in fatality in most cases. The alarming facet of cancer is that it may occur at any time at any age in any part of the body. It is caused by a complex, poorly understood interplay of genetic and environmental factors. It continues to represent the largest cause of mortality in the world and kills annually about 3500 per million populations around the world. Although more anticancer drugs are in active development with many of them under clinical trials, there is a pressing necessity to develop much more efficient and less toxic drugs especially from the plant kingdom to offer a cure for cancer patients. The overall aims and objectives of the current study is to observe the following end results: Apoptosis effect of curcumin using PC3, DU145 AND LNCaP prostate cancer cell line and Caspase 3/7 assay, Annexin IV assay and Tunel assay.

1

THE GENUS *OSCILLATORIA* VAUCHER (CYANOBACTERIA) FROM SELECTED MANGROVE ENVIRONMENTS OF SOUTHERN KERALA, INDIA

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Abstract -

The present work deals with the diversity of *Oscillatoria* Vaucher from the selected mangrove environments of Southern Kerala. The genus *Oscillatoria* is the most ubiquitous genus of Oscillatoriales of Cyanobacteria growing in almost all seasons and habitat. 10 species of *Oscillatoria* (*O. subbrevis* Schmidle, *O. curviceps* C.Agardh ex Gomont, *O. limosa* C.Agardh ex Gomont, *O. chlorina* Kutzing ex Gomont, *O. princeps* Vaucher ex Gomont, *O. chalybea* Mertens ex Gomont, *O. inaequalis* (Kutzing) Bornet & Flahault, *O. acula* Bruhl & Biswas, *O. ornata* Kützing ex Gomont and *O. schultzii* Lemmermann) have been identified from different mangrove environments *viz.* Alappuzha (Ezhupunna, Pathiramanal), and Kottayam (Kumarakom and Mekkara) districts. The least species diversity of *Oscillatoria* in the selected mangrove areas has been recorded at Kottayam district whereas the highest species diversity at Alappuzha district.

Keywords: Mangroves, Cyanobacteria, *Oscillatoria*, Southern Kerala

Introduction -

Cyanobacterial diversity in mangrove ecosystems is mainly controlled by the fluctuations in the physico-chemical characteristics of the water. The genus *Oscillatoria* is the most ubiquitous genus of Oscillatoriales of Cyanobacteria growing in almost all seasons and habitat. The species identification of Oscillatoriales has been carried out based on colour, sheath, cell measurement, constriction, granulation and end cell. The genus *Oscillatoria* is commonly identified with the visible motility of trichomes consisting of cells that are distinctly shorter than wide with a standard "ruler-like" cell division occurring in meristematic zones and, overall, simple filaments without any branching or specialized cells, such as heterocysts or akinetes (Vaucher 1803, Gomont 1892, Anagnostidis and Komárek 1988, Komárek and Anagnostidis 2005). The concept of classification of Oscillatoriales by Komarek and Anagnostidis (2005) is a comprehensive study and various taxa are arranged in a single order, 6 families and 12 subfamilies.

A survey of literature on Oscillatoriales revealed that according to the classical concept, 128 species of *Oscillatoria* has been reported from India (Tiwari *et al.*, 2007). Mangroves are occupied by numerous cyanobacterial communities and many of them are capable of nitrogen fixation (Hoffmann, 1999). The present communication is to distinguish different species of *Oscillatoria* from the selected mangrove ecosystems of Southern Kerala.

Materials and Methods -

The samples were collected from two districts viz. Alappuzha (Ezhupunna and Pathiramanal), and Kottayam (Kumarakom and Mekkara).

Table 1. Study areas.

District	Place	GPS Location
	Ezhupunna	9^{0}49' N, 76^{0}18'"E
	Pathiramanal	9^{0}36'N, 76^{0}23' E
	Kumarakom	9^0 36' N, 76^0 25' E
	Mekkara	9^0 48' N, 76^0 21' E

The cyanobacterial specimens were observed on the water bodies, soil, bark and pneumatophores of mangrove plants. Light-green, dark-green, dark-brown, olive coloured cyanobacterial samples were collected using forceps, needles, scalpel and knife. Photomicrographs were taken using a Leica DM 1000 LED compound microscope. Cyanobacterial identification was done using the relevant taxonomic publications.

Result and Discussion

Cyanobacteria is one of the most important primary production groups in aquatic environments and their productivity depends greatly on them. (Kamath *et al.* 2006). A total of 10 species of *Oscillatoria* were recorded. The least species diversity of *Oscillatoria* in the selected mangrove areas has been recorded at Kottayam district whereas the highest species diversity at Alappuzha district. Pathiramanal mangrove area occupies the most diverse species of *Oscillatoria*.

Table 2: List of *Oscillatoria* species identified from the different study areas

No	Species identified
1.	*Oscillatoria subbrevis* Schmidle

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Phytoplankton diversity of Tirur River, Malappuram District, Kerala

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Abstract

The present report was the systematic assessment of the phytoplankton in Tirur River, Malappuram District, Kerala, India. The survey was conducted at the three sites namely Tirur, Thazhepalam and Parapadi, of Tirur River and the species diversity of phytoplankton was analyzed from January to June 2015. From Tirur River, 57 taxa of phytoplankton were identified during the period of study, which come under 30 genera belonging to four taxonomic classes. The Bacillariophyceae (diatoms) was the diverse group comprised of 39 taxa belonging to 21 genera followed by the Cyanophyceae (blue green algae) represented by 14 taxa belonging to 7 genera. The Chlorophyceae (green algae) and the Euglenophyceae were represented by 2 species each belonging to one genus each. The algal taxa found in the marine environments included *Podosira montagnei* Kuetzing, *Stephanopyxis palmeriana* (Greville) Grunow, *Chaetoceros affine* Lauder, *Chaetoceros breve* Schutt, *Chaetoceros gracile* Schutt, *Chaetoceros lorenzianum* Grunow, *Pleurosigma angulatum* (Quekett) W. Smith, *Pleurosigma elongatum* W. Smith, *Pleurosigma normanii* Ralfs, *Pleurosigma salinarum* Grun. and *Gyrosigma balticum* (Ehr.) Rabh. were noticed in Tirur River, which indicates the brackish nature of water during the period of study.

Key words: Tirur River; Algal diversity; Phytoplankton; Malappuram District; Kerala.

Introduction

The phytoplankton are the major primary producers in the food web of riverine ecosystems, which serve as food for heterotrophic animals and finally the energy made available to the fish. The knowledge of the spatial and temporal distribution of plankton and the effect of environmental variables on them, will give a proper understanding of the ecosystem for the scientific utilization of the natural waters for fishery exploitation.

The phytoplankton respond rapidly to a wide range of pollutants and thus, provide potentially useful early warning signals of deteriorating conditions and the possible causes. A study on the diversity of phytoplankton in Kavery River, Tamil Nadu, showed higher quantity of

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RESEARCH PAPERS

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PLANTATION SECTOR IN KERALA: AN ANALYSIS OF TREND IN AREA, PRODUCTION AND PRODUCTIVITY

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Abstract : A plantation is a large piece of land or a group of commercial crops of perennial nature, cultivated extensively in a tropical or semitropical area. These crops are explicitly planted for extensive commercial sale. It needs employment of labour throughout the year and the products of which are usually consumed after processing. The crops grown include fast-growing trees, cotton, coffee, tea, cocoa, sugar cane, sisal, oil seeds (e.g. oil palms), rubber trees, and various fruits. The large size of plantation sector offers the advantage of economies of scale. It is crucial to maintain adequate nutrition programs to ensure high productivity, reduce losses, pollution and to take advantage of good management practices to replenish soil fertility. Plantation crops like tea, coffee and rubber are high valued commercial crops, which constitute around 15 percent of total agricultural export earnings in India. The sector has a very high export potential along with sufficient domestic supply. Being a highly labour-intensive sector, it plays a major role in the livelihood of thousands of labourers. The aim of this paper is to study the trend in area, production and productivity of plantations crops in India as a whole and in the state of Kerala in particular.

IndexTerms **- Plantation sector, Plantation crops, Area, Production, Productivity, Plantation agriculture.**

1.1 INTRODUCTION

Plantations are fundamentally large agricultural endeavours with many industrial characteristics. It provides the silver lining to our agriculture sector, with high level of productivity and employment, apart from their catalyzing contributions towards rural development. Being a highly labour-intensive enterprise, supplying modern technology and management tactics, plantation sector makes the optimum use of the marginal land resources and also generate considerable foreign exchange earnings by way of export.

Plantation crops fall into the category of plantation agriculture where a single crop is raised on a large area. Plantations are cultivated on an extensive scale in a large contiguous area, owned and managed by an Individual or a company. The agricultural economy of the state has been undergoing a noticeable process of diversification in the last few decades. A significant feature in the pattern of agricultural development witnessed since the early 1970s is the shift in the cropping pattern in favour of commercial crops. Food crops, largely the small farm sector, unable to withstand the domination of commercial or plantation crops, naturally lost the pride of place it once enjoyed and have become less remunerative compared to the more patronized plantation crops. The relatively higher profitability of cash crops and plantations, exemption of plantation crops from land reforms act and the promotional activities of the government are the main factors which account for the shift in the cropping pattern observed in the state. In the past, the choice of the crop was largely guided by agronomic considerations whereas the current emerging trends show that, more than anything else it is the economic forces that acts as the important determinant in decision making on the agricultural front.

An estimate by the Ministry of Commerce explains that more than two million people are involved in plantation sector directly and also another six million are engaged indirectly in the plantation sector. The major plantation crops growing states in India are Kerala, Karnataka, Tamil Nadu, West Bengal and North Eastern states. Due to the highly significant role played by the plantation sector in economic development, it is important to analyse the trend in area, production and productivity of plantation crops I n India as well as in the state of Kerala. This is important to understand the role and economic importance of plantation sector in an economy as well as in the lives of large number of people, depending on these plantations alone for their livelihood.

1.2 OBJECTIVES

The important objective of this paper is to understand the trends in area, production and productivity of three major plantation crops, which includes tea, coffee and cardamom in India and in Kerala and relate this to the altering marketing system.

1.3 METHODOLOGY

The present analysis is made on the basis of time series data from 1990-91 onwards. Data are obtained from the publications of Directorate of Economics and Statistics, Department of Agriculture and co-operation, Tea Board of India, Coffee Board of India, The Spices Board, Reserve Bank of India, latest Economic survey and Kerala Economic Review, District Handbook and Agricultural Statistics of Kerala.

1.4 REVIEW OF LITERATURE

Looking into the origin of plantations in the state, Raman (1986) and Hayami and Damodaran (2004) explains the historic background of the plantation sector. According to them, plantations were a product of colonialism and plantation crops exhibits a dualistic structure of production, with large area of holdings and also small holdings

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EMPLOYMENT STATUS OF SCHEDULED CASTE IN VADAKKENCHERRY PANCHAYAT: AN ANALYSIS

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Abstract

Education and employment are considered to be the most essential thing as far as all people are concerned, but pathetically the achievement in these fields are very low in our state. This is a personal view. And here I am saying this with my personal experiences, because here I am considering a specific caste especially Scheduled caste. Since they are belonging to the backward category. Their achievements too are poor in these fields. The achievements in these fields determines their standard of living. They are living in some way but actually they were far away from the main stream in every respects.

Key Words: Scheduled Caste, Education, Employment, Main stream

Scheduled caste is considered to be the most deprived section in our society. Their education as well as the employment generation are somewhat lesser as compared with others. Education and employment are considered to be the most essential thing as far as all people are concerned, but pathetically the achievement in these fields are very low in our state. This is a personal view. And here I am saying this with my personal experiences, because here I am considering a specific caste especially Scheduled caste. Since they are belonging to the backward category. Their achievements too are poor in these fields. The achievements in these fields determines their standard of living. They are living in some way but actually they were far away from the main stream in every respects

Objective

1.To study about the employment profile of the scheduled caste in the sample area.

Methodology

The study is completely based on primary data. For the purpose of study, I have selected 25 Scheduled caste households on a random basis and analysed the data with simple techniques like percentage and various tabulations too have taken.

Importance of the study

Scheduled caste is considered to be the most deprived section in our society. Their education as well as the employment generation are somewhat lesser as compared with others. Education and employment are considered to be the most essential thing as far as all people are concerned, but pathetically the achievement in these fields are very low. Therefore, their upliftment is essential.

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RESEARCH ARTICLE

ENERGY STORAGE WILEY

A dendrite free Zn-Fe hybrid redox flow battery for renewable energy storage

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Council of Scientific and Industrial Research (CSIR), Govt. of India

Abstract

About two thirds of global greenhouse emissions is caused by burning of fossil fuels for energy purposes and this has spurred great research interest to develop renewable energy technologies based on wind, solar power, and so on. Redox flow batteries (RFB) are receiving wide attention as scalable energy-storage systems to address the intermittency issues of renewable energy sources. However, for widespread commercialization, the redox flow batteries should be economically viable and environmentally friendly. Zinc based batteries are good choice for energy storage devices because zinc is earth abundant and zinc metal has a moderate specific capacity of 820 mA hg^{-1} and high volumetric capacity of 5851 mA h cm^{-3}. We herein report a zinc-iron (Zn-Fe) hybrid RFB employing Zn/Zn(II) and Fe(II)/Fe(III) redox couples as positive and negative redox systems, respectively, separated by a self-made anion exchange membrane (AEM). The battery delivers a good discharge voltage of approximately 1.34 V at 25 mA cm^{-2}, with a coulombic efficiency (CE) of 92%, voltage efficiency (VE) of 85% and energy efficiency (EE) of ~78% for 30 charge-discharge cycles. Repeated galvanostatic charge/discharge cycles show no degradation in performance, confirming the excellent stability of the system. A key advancement in the present Zn-Fe hybrid redox flow battery with AEM separator is that no dendrite growth was observed on zinc electrode on repeated charge-discharge cycles, which was the serious drawback of many previously reported zinc based redox flow batteries.

KEYWORDS

anion-exchange membrane, dendrite growth suppression, energy storage, redox flow battery, renewable energy, zinc deposition

1 | INTRODUCTION

Global climate change resulting from greenhouse emissions is causing increasingly severe risks for ecosystems, human safety and health. This combined with the large-scale demand for electricity expected during the coming decades has aroused great interest in the development of new technologies for energy production from renewable energy sources, such as wind, solar, and so on. However, these renewable energy sources are intermittent in nature and hence the success of these new renewable energy harvesting technologies needs to be associated with the introduction of competitive energy storage devices for grid scale energy storage. Unlike traditional batteries, the

ATTITUDE TOWARDS HIGHER EDUCATION BY THE SCHEDULED CASTE-AN ANALYSIS

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Abstract

Education especially higher education plays an important role for the development of any community. Due to the obstacles in literacy, education and like, the consciousness among those communities were poor. The study was focused on the attitudes towards higher education by the scheduled caste. It is found out that; the highly influencing factors were the ease of availability of institutions, availability of qualified teachers, expensiveness, time consuming and family background are the highly influencing factors.

Introduction

Education especially higher education plays an important role for the development of any community. It is important for the upliftment of human capital, especially the marginalized population's efficiency. Due to the obstacles in literacy, education and like, the consciousness among those communities were poor.

The level of higher education is determined by the size of the institutional capacity of the higher education system in the country. The size of higher education in turn is determined by the following indicators;

1. Number of educational institutions universities and colleges.
2. Number of teachers.
3. Number of students.

The higher education system in India has shown a considerable change since the economic liberalization. Tremendous growths of professional and technical institutions, emergence of more deemed universities, proliferation of more private institutions is some among them. The fall back of arts subject is such an unavoidable feature

The education state of affairs in Kerala is far sophisticated than other states of India. The Kerala model of development owes it endorsed triumph to the accomplishment in the field of education and health. Most of the developmental changes had been occurred since independence. The state pursued a liberal higher education policy from 1956 through mid eighties in terms of quantitative expansion and access to higher education. Schools and colleges in Kerala are run by Government and Private trust. The schools in Kerala affiliated to

FOREST FIRE RISK ASSESSMENT AND MANAGEMENT USING GEOSPATIAL TECHNOLOGIES

KRISHNA THEERTHA O. R[1], G. MADHU[1], DIPAK KUMAR SAHOO[1], SREEJITH A.C[2], VIVEK CHANDRAN .A[2], SUBIN K JOSE[3]

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ABSTRACT

Fire is a natural element present in all ecosystems and influencing many of its functions. The negative impacts include air and water pollution, loss of biodiversity, land degradation, desertification, soil erosion, impairment of human health and safety as well as loss of human life, forest flora and fauna throughout the world every year. Occurrences of forest fires and Ignition factors will be collected from various sources to construct from various sources to construct a GIS database, and then, validate the proposed model. The map will be done using ArcGIS 10.5 software to generate the maps of use and occupation, slope and aspect. Then use MCDM (Multi Criteria Decision Making) methodology in conjunction with fuzzy logic, in a participatory decision making framework to rank and prioritize the causative factors of fire risk in the study area. The study focuses on mapping of forest fire risk in the study area using GIS and remote sensing and then developing a forest fire management system based on topographic and meteorological factors. This mapping will serve as a tool for establishing public power as well as control measures in the areas of high susceptibility.

Keywords: *Forest fire mapping, GIS, Remote sensing, ArcGIS, Fuzzy logic, MCDM*

INTRODUCTION

Forests are an important part of human ecosystem. As per the present record, the world's total forest area is just over 3,999 million hectares (Global Forest Resources Assessment 2015). India has an estimated forest area of 7,08,273 sq. km that covers 21.54% of the total geographic area of the country. After taking into account the changes observed during two assessment periods i.e. ISFR 2015 (updated) and ISFR 2017, there has being an increase of 6,778 sq. km forest cover at the national level. Kerala state has contributed to an increase of 1,043 sq. km. As per the latest investigation done by FSI, about 36% of country's forests are prone to fires and of this; over 10% are severe fire prone areas. Forest fire can cause loss of ecosystem, depletion of wildlife, deforestation, global warming, and adverse health impacts (R.S.Ajin, 2016). The causes of forest fires can be divided into two broad categories. The first one is the '*Environmental*', which are beyond control and the second, '*Human related*',

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Odonates of Irinjalakuda ponds of central Kerala, India

One of the ponds sampled. Debris from the waste dumped can be seen floating (© Amitha Wilson).

Dragonflies and damselflies (Odonata) are good indicators of the freshwater ecosystem health because of their amphibious life history, relatively short generation time, high trophic position, and diversity (Corbet 1993). Ponds are home to a diverse community of specialized plants and animals and are hence of great conservation concern. Through land-use changes, ponds have been disappearing rapidly and the remaining ponds are often threatened by contamination and eutrophication, with negative consequences for pond-dependent taxa like Odonata (Janssen et al. 2018). Irinjalakuda is a municipal town in Thrissur District, Kerala, India. Irinjalakuda has a number of public and private ponds like most parts of the state. Twenty man-made ponds with public access were selected randomly in and around Irinjalakuda for sampling odonates (Figure 1 & Table 1).

The fieldwork was done in the post-monsoon season (November 2019–February 2020). Each pond was visited between 09 AM and 11 AM in sunny weather. The observers walked along the banks of each pond at constant pace for 30 minutes and recorded the species and the number of individuals seen. All individual odonates observed

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On level subsets of intuitionisic L-fuzzy graphs

Tintumol Sunny[1]*, Pramada Ramachandran[2] and Sr. Magie Jose[3]

Abstract

In this paper, we introduce the concept of intuitionistic L-fuzzy graphs and partial intuitionistic L-fuzzy subgraphs. Next, we define (s,t) level subsets and t cut sets of Intuitionistic L-Fuzzy Graphs and then move on to a systematic study of their structural properties especially with regard to the associated crisp graphs.

Keywords

Intuitionistic L-fuzzy graph, Partial intuitionistic L-fuzzy subgraph, (s,t) level subsets of Intuitionistic L-fuzzy graph, t cut sets of Intuitionistic L-fuzzy graph.

AMS Subject Classification

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Contents

1. Introduction

In 1736, Euler introduced Graph theory, the most inter disciplinary branches in mathematics with a great variety of applications. To describe the phenomena of uncertainity, in 1965 Lotfi. A. Zadeh introduced a new mathematical frame work in his seminal paper entitled "Fuzzy Sets" [9]. The fuzzy sets give the degree of membership of an element in a given set. To describe the uncertainity in objects and in their relationships, Rosenfeld[6] introduced fuzzy graph theory in 1975. Yeh and Bang[8] also introduced fuzzy graphs independently. As a generalization of fuzzy sets, Atanassov[2] introduced the concept of intuitionistic fuzzy sets in 1986 by adding a new component which determines the degree of non-membership in the definition of fuzzy set. i.e., Intuitionistic fuzzy sets give both a degree of membership and a degree of non-membership(which are more or less independent from each other) such that the only requirement is that the sum of these two degrees should be less than or equal to 1. Intuitionistic fuzzy sets have been applied in a wide variety of fields including computer science, engineering, mathematics, medicine, chemistry etc. Atanassov[3] introduced the concept of intuitionistic fuzzy relations and Intuitionistic Fuzzy Graphs(IFG). Akram M and Davvaz B introduced the concept of intuitionistic fuzzy graph elaborately and analysed its components[1]. Pramada Ramachandran and K. V. Thomas introduced the concept of L-Fuzzy graph[5] as another extension of fuzzy graph.

In this paper, we introduce Intuitionistic L-fuzzy graph as a generalization of L-fuzzy graph. We discuss about its (s,t) level sets and t-cuts. We also try to study the properties of (s,t) level subset of an Intuitionistic L-fuzzy graph.

2. Preliminaries

In this section, we review some basic definitions that are necessary to understand the new concepts introduced in this paper.

Definition 2.1. *[4]*

A fuzzy graph $G = (V, \sigma, \mu)$ with the underlying set V is a nonempty, finite set V together with a pair of functions (σ, μ) where $\sigma : V \to [0,1]$ and $\mu : V \times V \to [0,1]$ such that $\mu(x,y) \leq \sigma(x) \wedge \sigma(y), \quad \forall (x,y) \in V \times V.$

Definition 2.2. *[1]*

An intuitionistic fuzzy graph with underlying set V is defined to be a pair $G = (\sigma, \mu)$ where

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Room temperature deposition of high figure of merit p-type transparent conducting Cu–Zn–S thin films and their application in organic solar cells as an efficient hole transport layer

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ABSTRACT

High figure-of-merit p-type transparent conducting Cu–Zn–S thin films with Zn doped CuS structure were successfully deposited by Successive Ionic Layer Adsorption and Reaction (SILAR) method at room temperature. Films were deposited with an optimal Cu:Zn:S ratio of 75:25:50 in the precursor solution. The thickness of the films was controlled by varying the number of deposition cycles. The composition, structure, morphology, electrical, electronic and optical properties of the as deposited films were studied in detail. All the films exhibited relatively high conductivity and transparency resulting in high figure-of-merit values. Overall, the hole concentration and conductivity are in the range of degenerately doped semiconductors. The Cu–Zn–S film deposited with 40 nm thickness has an electrical conductivity of more than 1000 S/cm and average optical transparency greater than 81% in the visible region. These values are higher than most of the other reported p-type transparent conducting materials, especially for room temperature deposition. Conventional bulk heterojunction organic solar cells were fabricated with structure ITO/Cu–Zn–S/P3HT:$PC_{71}BM$/ZnO/Al, where Cu–Zn–S is the hole transport layer. The best configuration resulted in an efficiency of 1.87% suggests the suitability of Cu–Zn–S thin films as a hole transport layer in organic solar cells.

1. Introduction

Transparent conducting materials (TCMs) are those materials that possess both high optical transparency and high electrical conductivity. These materials are an important component in a number of electronic devices including flat-panel displays, touchscreens, light emitting diodes (LEDs), solar cells and many other optoelectronic devices [1–3]. In LEDs and solar cells, they are typically used as low resistance electrical contacts transparent to light. The most widely used and studied TCMs are n-type semiconductors. For example, Sn-doped In_2O_3 (ITO), F-doped SnO_2 (FTO), Al-doped ZnO (AZO) are all n-type and are being used commercially in optoelectronic devices as transparent conductors [2,4]. ITO is the most extensively used TCM with optical transparency above 90% and electrical conductivity ~10^4 S/cm [3,5,6]. However, p-type semiconducting materials with comparable transparency and conductivity are not so well developed [1,4,7]. Since a p–n junction is the key building block of most semiconductor devices, p-type TCMs of similar quality could open up new design spaces for optoelectronic devices and transparent electronics [7,8].

The most reported p-type TCMs till now are Cu-based semiconducting transparent oxides. $CuAlO_2$, successfully deposited by Kawazoe et al., in 1997, having a room temperature conductivity of up to 1 S/cm, is regarded as the first reported p-type Transparent Conductive Oxide (TCO) [9]. A series of p-type Cu(I) based delafossites, with structure $CuMO_2$ (M = Ga, In, Y, Sc, Cr) were reported subsequently as optically transparent oxides initiating extensive attention to these type of materials [10–15]. However, the deposition of most of these TCO films is realized through physical deposition methods such as pulsed laser deposition (PLD), sputtering and evaporation techniques [9–15]. These methods involve a high vacuum environment, sophisticated equipment and either a

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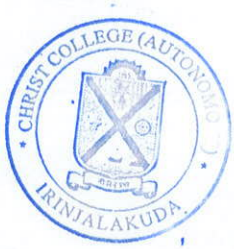

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THE RELEVANCE OF THE IRRELEVANCE THEORY OF CAPITAL STRUCTURE WITH REFERENCE TO OIL INDIA AND RELIANCE LTD

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Abstract
There are four major theories associated with capital structure. The present study gives emphasis on the "Theory of Irrelevance of Capital Structure" propounded by David Durand. According to this theory the capital structure of the companies do not affect their financial performance. This theory is also known as the net operating income theory. The question always arises as to which the most suitable theory is. Here a horizontal financial analysis has been carried out on two oil exploration and production companies in India. The present study takes in to account four variables for analysis namely return on equity, total debt to equity, interest coverage ratio and debt ratio.
Keywords: Capital structure, Financial Performance, Return on Equity, Total Debt to Equity, Interest Coverage Ratio and Debt Ratio.

1.1 Introduction

Capital structure simply refers to the make-up of capitalization of a firm. It is the composition of debt and equity which the company utilizes in order to finance its long term needs. Debt capital is long term borrowings of the company whereas equity can be termed as the long term funds provided by the owners of the company (shareholders). R. H. Wessel has defined capital structure as follows – "The term capital structure is frequently used to indicate the long term sources of funds employed in a business." Capital structure of a firm as a direct effect on the financial risk assumed by the company and also the cost of capital. It also affects the value of the firm and its financial performance. There are a plethora of factors that affect the capital structure of a firm. They can be classified as internal and external factors. Some of the internal factors include profitability, liquidity, flexibility, size and nature of business, regularity of income, desire to retain control etc. the factors over which the management of the company has no control over is termed as external factors. Some of them are conditions in capital market, attitudes of investors, legal and taxation policy, cost of financing and also attitude of management. Actually the decision regarding the capital structure is extremely tricky as there are a number of quantitative and qualitative factors involved in it. Most of the efforts of managers is to obtain an optimal capital structure.

In this study we are trying to analysis the effect of capital structure on the financial performance of the firms. Primary focus has been given to analyzing the NOI theory and whether it holds true in this real life study. We have chosen to study two oil extraction companies. Strength of financial position of a firm is called as financial performance of a firm. Financial analysis can be defined as the process through which the financial strengths and weakness of the firms can be identified by stating the relationship between items that are stated in the balance sheet and profit and loss account. Thusthis paper focus on the "Theory of Irrelevance of Capital Structure" propounded by David Durand

1.2 Review of Literature

There are numerous studies that intend to throw light in to the relationship between financial performance and capital structure. Empirical results have been inconsistent. Modigliani and Miller (1958) said that the capital structure does not effect to the financial performance, but later corrected their stance and said that the financial performance is affected by the financial leverage as the use of debts give tax advantages (1963). A study was conducted to analyze the impact of debt equity ratio with the financial performance which was indicated using the EPS, ROI, Capital turnover, debt to net worth, net profit ratio, return on capital employed and return on equity. The study used the samples from automobile sector, electronic sector and metal industries. With the data available, the researcher made a conclusion that the capital structure of the selected automobile companies has not affected the financial performance, whereas the metal and electronic segment was significantly affected by the capital structure. (Rani, Kavita 2015). Khalifa, M. (2014) targeted to analyse the effect of capital

Device modelling of non-fullerene organic solar cell with inorganic CuI hole transport layer using SCAPS 1-D

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Influence of Gender and Self-Confidence on Body Apperception in Undergraduate College Students

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Abstract: ***An individual's gender and self-confidence are the two factors which have a significant influence on body apperception. The purpose of the study was to explore the influence of gender and self-confidence on an individual's body apperception in undergraduate college students and to understand the predictive nature of gender on body apperception. A sample size of 80 undergraduate college students were considered for the investigation. In the sample, males and females were equally distributed. Measure of body apperception (MBA) and self-confidence scale was used to measure body image perception and self-confidence. The research concludes that there exists a weak positive correlation between body apperception and self-confidence, and there is a significant difference of body apperception among male and female college students with a higher apperception in females. It is also revealed that gender is a stronger predictor of body apperception.***
Keywords: Body apperception, Self-confidence, Gender, Undergraduate college students

I. INTRODUCTION

Psychological functioning and well-being of a person are largely influenced by the perception of their own body image. Muth and cash stated that "body image is a multidimensional construct representing cognitive, affective and behavioural responses to an individual's own physical attributes" [17]. There are two primary components of body image satisfaction and they are approval or disapproval with one's own physical qualities and knowledge of discrete emotions. Body image plays a major role in the development of self-confidence in adolescents because of the fact that it functions as a valuable basis for self-assessment and evaluation by others [21]. The degree and nature of a person's body image have a significant influence on their performance in nearly all aspects of life, particularly in the developmental stages. The consequences caused by one's level of body satisfaction varies widely. Attainments in life [16], absenteeism in school [23], addictions and eating behaviours [18], bullying [7], mental health problems [20] have been reported to be positively correlated with one's own body satisfaction. Perceptions of physical appearance are one of the single strongest predictors of self-confidence among male and female adolescents [6]. Even though physical appearance serves different purposes in both the genders, it is important for maintaining popularity and self-confidence among them [2], [3]. A number of studies have examined the relationship between negative body image and low or negative self-esteem [1], [12]. Coherent sense of self and establishment of individuality are the two main developmental tasks to be achieved during the adolescent's period [19]. The eating disorder caused by poor self-confidence could lead to the dissatisfaction of body image [12]. The people who state a greater degree of body dissatisfaction also presented mediocre self-esteem [12], [22]. Generally, females are comparatively much more body-conscious than their male counterparts. Women were given greater focus when it comes to body image research [15]. Studies focused on their dissatisfaction with their own body and that could result in eating disorders in comparison to men [11], [10]. The concept of a thin ideal women body which the media and society are propagating often makes discrepancy between one's own body in females and this leads to body dissatisfaction [5]. There has been a proliferation of the ideal man body over the last decades. Numerous studies have revealed that men, like women, sense greater dissatisfaction when they are challenged with an ideal body of their own sex [9], [4].

II. SCOPE AND SIGNIFICANCE OF THE STUDY

The study is of great significance for the people belonging to the adult and adolescent population. It informs that a person's body image is an important factor that influences their self-confidence. This can be thus maintained to develop their confidence which would lead to overall success in their path of life. The prevalence of the ideal women concept within the society is clear from the data, showing that women are more concerned about their body image and the concept of an ideal man has been existing in the Western culture for long periods too. This concept of an ideal man has started its path in the Indian culture by putting men into the pressure of fitting to this concept like the women. Maintaining one's body image is thus an important influential factor which can be utilised by the marketing department and also by the individuals to grow a potential society.

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Influence of Gender and Self-Esteem on Appearance Anxiety among Undergraduate College Students

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Abstract: ***One of the biggest issues faced by teens and young adults in their life is appearance anxiety. The purpose of the study was to understand the influence of gender and self-esteem with appearance anxiety among undergraduate college students and to understand the predictive nature of students' self-esteem and gender on appearance anxiety. Undergraduate college students of age ranging from 18 to 21 were considered randomly from educational institutions of Irinjalakuda municipality. Equal number of male and female students were considered. Rosenberg Self-Esteem Scale and Appearance Anxiety Inventory was used to measure appearance anxiety and self-esteem of the sample population. The research concluded that there exists a moderately strong relation between appearance anxiety and self-esteem, and there lies a significant difference of appearance anxiety among male and female undergraduate college students. It is also revealed that gender is a much stronger predictor of appearance anxiety than self-esteem.***

Keywords: ***Appearance anxiety, Self-esteem, Gender, Undergraduate college students***

I. INTRODUCTION

The concept of self-esteem has always been central to the psychologist for conducting their research. It has now successfully added itself into the list of household words. Coopersmith defined global self-esteem as "a personal judgement of worthiness that is expressed in the attitudes the individual holds toward himself" [7]. Our self-evaluations according to James are connected to the beliefs [16], which we hold regarding our abilities to accomplish our personal goals whereas Cooley claimed that our self-esteem totally relies upon the perceptions regarding what others think of us [6]. Hence, in valued "domains a global self-esteem encompasses perceptions of abilities and perceptions of social acceptance" [15]. Harter claims that self-esteem somewhat stays stable within major developmental, but is less stable during the transitional periods, for instance, the transition between middle childhood to adolescence [15]. Self-esteem concept might not be understood till an individual is an adolescent and starts to reflect on his/her personal values [8]. It has become a major part of the adolescent's self-understanding and is susceptible to external as well as internal influences during adolescence [2]. That's the reason parents, teachers, therapists, and others have started to put their efforts on working for boosting self-esteem because they assume that self-esteem will lead to positive outcomes. Many researchers have started to study about the role played by gender in influencing adolescents' self-esteem. The patriarchal societies claim self-confidence as solely male features whereas for girls having self-confidence has always been considered a breach of traditional gender roles. That's the reason recent studies have concluded that in the boy's self-esteem is relatively higher than girls. Boys are often seen more in situations which are linked to encouraging power, conflict, competition and excitement whereas girls are linked to situations of support, intimacy, co-rumination and self-disclosure. While boys developing emotions is more to externalising problems its vice versa in girls [2]. A very important source of self-esteem is an individual's body image [29]. As a child grows up, he/she tends to build an image of themselves which is developed by what people see in them and what they can or cannot do. Opinions related to our bodies if are really poor then it causes low self-confidence and self-esteem. The concept of body image is multidimensional, "behavioral component involves body-related behaviors, perceptual component involves the perception of body characteristics and the cognitive-affective component involves attitudes, cognitions and feelings toward one's body" [5], [32], [34], [36]. Szabo studied the relationship between self-esteem and body image in young adults and found out that discrepancy in ideal and perceived body image is linked to low self-esteem [30]. Festinger in his social comparison theory said that the comparison done by an individual about himself/herself with others is either downwardly or upwardly [10]. "The Upward comparison leads to lower satisfaction whereas downward comparison leads to a feeling of superiority" [19]. Globally, a new cultural stereotype has appeared which is the linking of physical attractiveness with personal positive qualities. Not just European countries, but also the Asian countries are of the opinion "the marker of health and fertility a small waist has always been an invariant symbol of feminine beauty" [24].

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Research Paper

The effect of leisure travelling on emotional intelligence and life satisfaction among women of Kerala

Aysha P N[1]*, Shamsudheen Shahana[2], Durga K S[3]

ABSTRACT

The new trend of the 21st century is "travel wellness" which has provided a substantial opportunity for uplifting the tourism industry. The scholars have started to shift their interest to know how and what factor leads to the enhancement of wellness in an individual. The two such factors which are of highly importance are emotional intelligence and life satisfaction. The purpose of the investigation is to understand the effects of leisure travelling on emotional intelligence and life satisfaction among women who leisure travel and women who don't in Kerala and to understand the predictive nature of leisure travelling on a women's emotional intelligence and life satisfaction. A sample of 164 women was considered for the study. There were 64 women who did leisure travelling and 101 women who didn't. To collect the data for the study Satisfaction with Life Scale and The Brief Emotional Intelligence Scale were employed. To analyse the data Pearson correlation, independent sample t-test and simple linear regression were done. The research concluded that there exists a moderately strong relation between emotional intelligence and life satisfaction. There lies a significant difference in emotional intelligence and life satisfaction among women who do leisure travelling and women who don't. It's also revealed that Leisure travelling is a much stronger predictor of emotional intelligence than life satisfaction.

Keywords: *Emotional intelligence, life satisfaction, leisure travel, women, Kerala.*

With the advent of industrialisation, it was very important to work on the advancement in communication and transportation. The progress during the industrialisation was happening quickly all over the world and now the results are very much visible to all of us. The easy availability of the things at one click, travelling from one place to another and connecting to people living far away has become so easy. The one such industry which has given a boost up to the economy is the tourism industry. The work culture has made people think of going off for a few days from work to have a vacation at some exotic destination. The researchers have started to pay more attention to the research to know about the benefits of the travel experiences. Tourism is the new mental and physical health pursuit. A study providing the

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Influence of Maslow's Need Hierarchy on the Grit of Undergraduate Students

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ABSTRACT: Grit is a combination of passion and perseverance which is creating a new wave in the field of Psychological research in individual's achievement and success. The purpose of the study was to determine whether Maslow's hierarchical needs influence a person's grit growth. A sample of 182 college students was taken for this research. The tools which were employed for the purpose of collecting the data were Short-grit S scale, General belongingness scale, Rosenberg self-esteem scale and self-actualization inventory. The data was then statistically analysed using the Pearson correlation test, simple linear regression and multiple linear regression. Later on, it was concluded that there is a relationship between the Grit of an individual and their need for belongingness, self-esteem and self-actualization. It was also seen that growth of grit and Maslow's hierarchical needs are co-dependent on each other.

KEYWORDS: Grit, Maslow's need hierarchy, Belongingness, Self-esteem, Self-actualization.

I. INTRODUCTION

Grit is important in one's life as it helps in enhancing the performance of an individual in various aspects of life. A proper motivation given to a gritty person can help him to achieve a higher goal smoothly. According to Duckworth, grit can be characterized as "perseverance and passion for long-term goals". Passion is an intense emotion to a specific subject. The intensity of passion determines our motive to fulfil a particular task. According to Oxford Dictionary, "Perseverance in doing something differently or delay in achieving success''. In many cases, grit is often confused with achievement, but it's not actually that. The distinctive factor of grit is that the person never loses their hope even after having many attempts of failure. Focus and stamina are two most observed qualities in a gritty person when compared with a normal person (Duckworth et al., 2007). The feeling of boredom is much lesser in a gritty person because of their passion related to a particular subject. According to Duckworth major traits of grit are purpose, hope, interest and practice (Duckworth, 2016b). A purpose is more or less a motivation to do certain work. It is the reason why one pursues their desired goal without backing-down even when failure strikes. Interest is the passion to do a particular set of tasks and at the end leads the person to fully enjoy the work they do. Practice is a process by which one keeps trying until they achieve the goal. A gritty person always prefers a scientific way of practice. Hope is a strong feeling of attaining positive outcomes. It determines the optimistic nature of a person towards a particular task. Studies indicate that gritty students attain more academic achievement than non-gritty peers (Duckworth et al., 2007, Arslan et al., 2013). Prolonged practice, zeal and hard work improve academic excellence in a gritty person (Duckworth et al., 2007; Duckworth et al., 2009).

Maslow's hierarchy of needs is the most established motivation theory till now. Maslow was one of the great pioneers of the humanistic school of psychology. He highlighted the optimistic nature of human beings which further strengthen the idea of self-actualization. Maslow stated that human beings are categorized as "wanting animals" as his craving never ends. According to him, a person's behaviour is the result of satisfying his certain needs. Maslow developed his five-level hierarchy of needs by analysing the development and growth of his students. His hierarchy of needs provides

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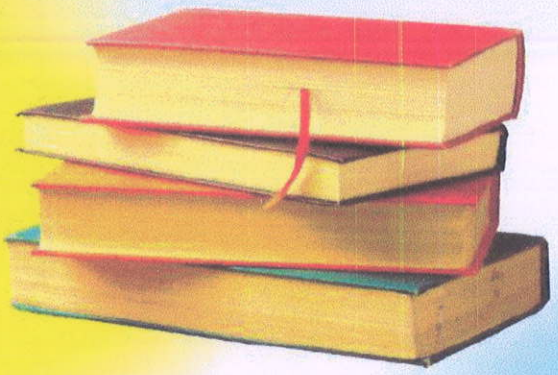

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impacts of tourism on forest area of Athirappilly region by comparing Landsat images from 1998 and 2010. The affected areas of forest as a result of tourism introduction based on physical characteristics. These are landscap use/cover), topography (slope, drainage) and settlement size. At First, a list of tourism related criteria were devel raster based weightage method was carried out for the preparation of tourism disturbance map. GIS based tec measure the ranking of different criteria according those with the best potential for the study data utilized incl geographic maps. Subsequently, the forest disturbance map was created based on the combination of criteria respective weights. The disturbed area of forest was classified as very high, high, moderate and low. The meth useful in identifying disturbed areas of forest by linking the criteria deemed. GIS can then subsequently evalua land use cover as well as, providing a tool for ecotourism planning in Athirappilly areas. Likewise, this study can identifying mitigation measures for more complex studies in future.

Keywords: GIS, Tourism, Forest disturbance, Athirappilly, Raster

1. Introduction

Tourism is one of the fastest growing industries globally, and within tourism, the nature-based tourism is considered to be growing most rapidly Even if a region has rich ecological and cultural wealth that might have tourism potential, tourism develops in a way that it directed purposefully, i.e., tourism geography is a construct by the agencies, and natural as well as cultural landscape is only fine-tuned for it in the process. (Jussi Ramet etal, 2010). Sangeetha, (2014) have discussed that Tourism in India has seen exponential growth in the recent years. India is one of the most preferred destinations for both overseas and domestic travelers. Tourism enables the international traveler to understand and experience India's cultural diversity first hand. According to official estimates the Indian tourism industry has outperformed the global tourism industry in terms of growth in the volume of foreign tourists as well as in terms of revenue. The main reason for the growth in tourism in India is the tremendous progress made by the Indian economy. Kerala, a state situated on the tropical Malabar Coast of south western India, is one of the most popular tourist destinations in the country. Named as one of the ten paradises of the world by the national geographic channel, kerala is famous especially for its ecotourism initiatives its unique culture and traditions, coupled with its varied demography, has made kerala one of the most popular tourist destinations in the world. Tourism industry is a major contributor to the state's economy (Vinay Raj R, 2012).

Tourism and the environment have a very complex and interdependent relationship. Tourism one of the largest industries in today's world economy and is a largest source of foreign exchange for many developing location whose major use are their natural resources (Sindio,1984). The environment is being increasingly recognized as a key factor in tourism. During the last decade of th this idea has strongly emerged tha ultimately upon the environment, as it attraction itself, or is the context in wh takes place (Holden, 2000). Josphat pointed out positive effects of tourism a areas. The positive effects include employment, the increase in the econon of conservation of natural spaces, mini of the local population, and improvem and socio-cultural level of the loc commercialization of the local products costumes. Negative effects include the r of ground (space), water, energy, destr with the creations of new infrastructu production of disposals (wastes), ecosystems, the introduction of exotic and plants, the loss of traditional ha idleness), the increase in prostitution narcotic traffic, more forest fires and prices of goods and services (e.g. ho tourist destination). Tourism affects th protected area in any destination either cumulatively which could determine tourism and its related activity in the pro Belsoy, 2012).

Natural resource managers and environ require reliable information about the associated with natural and anthropog forests (Bricker and Ruggiero, 1998). munity has begun to explore nev characterize, and monitor forest c integration of remote sensing and information system) data and technol al,2004). The integration of remotely takes four forms: (a) GISs can be used

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The Influence of School Type and Self-Efficacy on Academic Stress among Higher Secondary School Students

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Abstract: ***In the modern world academic stress is a factor which could significantly impair the quality of learning and academic performance of a student. The purpose of the research was to understand the influence of school type and self-efficacy of students belonging to higher secondary level of education upon their academic stress, and also to understand the predictive nature of student self- efficacy on academic stress. A sample of 120 higher secondary school students of age ranging from 16-17 were considered randomly from educational institutions of Palakkad district. Kim's academic stress scale and Schmitz and Schwarzer's student's self-efficacy scale was used to measure the academic stress and self-efficacy of the sample population. Data was collected and analysed using independent sample t-test, Pearson correlation and simple linear regression. The research concludes that there exists a moderately strong relation between academic stress and self-efficacy, and there lies a significant difference of academic stress among the state and the CBSE school students. It is also revealed that school type is a much stronger predictor of academic stress than self-efficacy.***

Keywords: Academic stress, self-efficacy, school type, Higher secondary students.

I. INTRODUCTION

The period of schooling is that major part of a child's life where they experience drastic changes from their simple life till then. Schooling is that major period of growth, development and proliferation within the child that moulds them in every different aspect as a human being. Even though schooling is considered as a great opportunity for the children to explore, enjoy and know the world around them, the process of schooling has also resulted into a set of serious matters that must be keenly discussed. The education system has come up with very little changes over long years of time and has been focussing upon creating similar kinds of individuals by giving importance to the academic scores they acquire over their academic lifetime. Is knowledge-seeking or securing grades more important in the academic sector has been a debatable issue over the past decades. All such discussions have led to changes in the related thoughts among people and minute steps are being visible in the present scenario. Focussing onto the conditions the students face in their school life academic stress has become a very major problem affecting a majority of the population. The factors that influence this academic stress like the social expectation and the pressure placed upon the students from their young ages and the individual differences within the individual are of major concern to be focussed.

Stress and anxiety are two important factors that directly and indirectly affect all ages of people. School students are also the ones who appear particularly at risk to this reality when compared with the different age groups of people. They are going through the period of rapid biological change, social expectations, social interactions, personal development and peer influence which altogether creates a novel situation for them to face in their early ages. School environments have a major influence on these developmental factors as school becomes the second home to the children which has a great role in moulding an individual. For many students, the period of higher secondary education is extremely stressful and could cause slight to severe issues including depression, insomnia, mood swings, general fatigue, a sudden drop in grades, temper tantrums and aggression. In the academic life of an Indian student, Higher secondary school education is one of the most significant turning points in their life. This stage plays a significant role in deciding the student's options or choices for higher education and even probably career too [12]. Gupta stated that "Academic stress is mental distress with respect to some anticipated frustration associated with academic failure or even awareness of the possibility of such failure" [7]. Grades, self-imposed need to succeed, social pressure for higher marks and studying are the main cause for academic stress [9]. The causes of academic stress can be grouped into seven categories and they are stress due to exams and test, stress due to interpersonal relation between teachers, stress due to peer relationships, stress due to time management and infrastructure, stress due to infrastructure availabilities, stress due to self-inflicted causes, stress due to parental and social related issues.

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● ABHILASH PETER AND RAJMOHANA K.

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Descriptions of two new species of *Macroteleia* Westwood (Hymenoptera: Scelionidae) from India

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Abstract

This paper describes two new species of *Macroteleia* Westwood, viz., *M. kairalii* sp. n. and *M. shyaama* sp. n. from India. A key to species of India, based on females is also provided.

Keywords: *Hymenoptera, Platygastridae, new species, Scelioninae.*

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Introduction

The genus *Macroteleia* (Platygastroidea: Scelionidae) was erected by Westwood (1835) based on type species *Macroteleia cleonymoides* Westwood. As per the available host data, members of this genus are egg-parasitoids of long-horned grasshoppers (Orthoptera: Tettigoniidae) (Chen *et al.*, 2013). Ashmead (1893) reared them from *Orchelimum glaberrimum* (Burmeister, 1838) (Orthoptera: Tettigoniidae), while Morgan (1901), Brues (1907), Cole (1931), Priesner (1951), Muesebeck (1977) and Kononova and Kozlov (2008) too reared them from orthopteran eggs.

With an elongate and robust habitus, *Macroteleia* is close to *Habroteleia* Kieffer and *Triteleia* Kieffer, though the absence of post marginal vein easily separates *Habroteleia*. *Macroteleia* can be differentiated from *Triteleia* by their laterally compressed sixth tergite in females; the same is dorsoventrally flattened and triangular in *Triteleia* females. In *Macroteleia* males, the apical tergite is apically emarginate or with a terminal single spine, while postero-lateral corners of male apical tergite is bispinose in *Triteleia* (Masner, 1976; Chen *et al.*, 2013).

The genus is represented by 133 valid species globally (Hymenoptera Online, 2020), of which only 8 species are reported from India (Mani and Sharma, 1982; Rajmohana, 2006). In this paper two new species *M. kairalii* **sp. n.** and *M. shyaama* **sp. n.** are described. A key to Indian species of *Macroteleia* Westwood, based on females is also provided.

Materials and Methods

The present study is based on specimens collected through Malaise traps, Yellow pan traps, and Sweep net. Specimens were studied and imaged under Leica M 205A stereomicroscope, with Leica DFC 500 camera. Images were processed using extended focus montage LAS software. The holotypes and other material examined are deposited at Western Ghat Regional Centre, Zoological Survey of India, Kozhikode, Kerala (ZSI, WGRC). Terminology followed is based on Miko *et al.*, 2007.

Abbreviations

A1-A12- Antennal segments; HL- Head length; HW- Head width; EH- Eye height; IOS- Inter orbital space; L- Length; *m*- Marginal vein; MW- Mesosoma width; ML- Mesosoma length; OOL- Ocello-ocular length; OD- Ocellar diameter of median ocellus; *pm*- Post marginal vein; POL- Posterior ocellar length; LOL- Lateral ocellar length; *stg*- Stigmal vein; T1-T2- Tergites of metasoma; S2-S6- Sternites of metasoma; W- Width.

Results

Key to the species of genus *Macroteleia* Westwood from India based on females

1. Propodeum divided into two separate triangular lobes.....2

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Report of a new host plant for *Eligma narcissus* Cramer (Lepidoptera: Nolidae)

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ABSTRACT: *Oroxylum indicum* (L.) Benth. ex Kurz is reported as a new host plant for *Eligma narcissus* (Cramer) from Kerala, India. This is the first record of Bignoniaceae as host plant for the genus *Eligma* Hubner. © 2020 Association for Advancement of Entomology

KEYWORDS: Bignoniaceae, host plant, India, Nolidae

Family Nolidae (Lepidoptera) includes moths that are widely distributed with 1879 living species under 206 genera (Catalogue of Life, 2020). Though occurring worldwide, Nolidae shows primarily palaeotropical distribution (Kitching and Rawlins, 1998). Several species of this group are agricultural pests. Family Nolidae includes 8 subfamilies viz., Diphtherinae, Risobinae, Collomeninae, Beaninae, Eligminae, Westermanniinae, Nolinae and Chloephorinae (Zehari *et al.*, 2012b). Earlier, Nolinae was either treated as subfamily of Arctiidae or Noctuidae by many workers (Gardener, 1941, 1943, 1948, Holloway and Miller, 1995, Poole 1989). Later molecular and phylogenetic studies of Zehari *et al.* (2011, 2012a) revised the status of Nolinae and treated as a subfamily of Nolidae.

Adult moths of family Nolidae are small in size, mostly dull coloured with tufts of scales on forewings. Moths of this group are easily identified from their morphological characters like elongation of the forewing retinaculum in a bar-like or digitate condition and possession of a post spiracular counter-tympanal hood (Zehari *et al.*, 2012b). Another interesting feature of the larva of many genera of Nolidae is the presence of swollen, bulbous- like structure on the head which is nothing but the stack of moulted old caterpillar head capsules for defense (Petah *et al.*, 2016). The cocoons of this moth family are boat-shaped and pupae lack cremasters. Larvae feed leaves, stem, pods and seeds.

Genus *Eligma* Hubner belongs to the subfamily Nolinae of superfamily Noctuoidea. A total of 9 species are known globally. Only one species is known from India (Catalogue of Life, 2020). Though phytophagous, biology of many species of *Eligma* is still unknown. *Eligma narcissus* (Cramer) 1775 is a serious pest of *Ailanthus* in Southern India (Roonwal, 1982). The life cycle consists of egg, larva, pupa and adult. Eggs pale white, larva bright sulphur yellow with black and red patches, pupa dark brown. Moths oviposit in clusters,

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A checklist of bees (Insecta: Hymenoptera: Apoidea) of Kerala

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ABSTRACT: A checklist of bee species from Kerala based on literature survey belonging to three families are listed. Accordingly 86 species of bees under 19 genera are enumerated.

KEYWORDS: Bee fauna, Apidae, Halictidae, Megachilidae

INTRODUCTION

Bees are the group of beneficial insects belong to the order Hymenoptera. They are the members of the superfamily Apoidea and are further classified into seven families namely, Apidae, Halictidae, Megachilidae, Andrenidae, Colletidae, Melittidae and Stenotritidae (Michener, 2007). Bees are known for their important role as pollinators in nature since they provide valuable pollination services to many crops and natural vegetations (Free, 1993; Delaplane and Mayer 2000; Michener, 2007; Thakur, 2012). There are 20,473 described species of bees in the world (Ascher and Pickering, 2020). Bees exhibit a wide range of lifestyles from solitary to social (Benton, 2017). Honey bees, bumblebees and stingless bees are social bees. They live in colonies in which the members follow the division of labour.

In India, important works on the taxonomy of the bees were done by Bingham (1897). Jobiraj (2002) conducted studies on the systematics of the bee family Apidae of Kerala. Gupta in 2003 published an annotated catalogue of bees of Indian region. Saini and Rathor (2012) published an Indian checklist of Halictidae family bees and reported 194 species under 27 genera. In 2017, Pannure and Belavadi published a distributional checklist of subfamily Nomiinae of South India and recorded 48 species under 13 genera. Sheeja and Jobiraj (2017) conducted studies on the bee fauna of the Vanaparvam biodiversity park, Kozhikode, Kerala and identified 18 species belong to 9 genera. In 2018, Manjusha and Jobiraj published a checklist of Nomiinae subfamily of Kerala which contains 25 species under 12 genera. Bijoy *et al.* (2019) recorded 19 species of bees belonging to 7 genera from rice ecosystems of Palakkad. In India there are 796 species of bees under 71 genera (Pannure and Belavadi, 2019). The present checklist provides a list of the bee fauna of Kerala.

MATERIALS AND METHODS

This checklist was prepared entirely based on a literature survey and no specimens are examined for this purpose. Details regarding the bee diversity

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SHORT COMMUNICATION

A DIVERSITY OF SPIDERS (ARACHNIDA: ARANEAE) FROM A CASHEW ECOSYSTEM IN KERALA, INDIA

Mamparambath Subramanian Smitha & Ambalaparambil V. Sudhikumar

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CHECKLIST OF SPIDERS FROM THE SACRED GROVES OF NORTHERN KERALA, INDIA

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AUTHORS' CONTRIBUTIONS
This work was carried out in collaboration between both authors. Author NVS designed the study, wrote the protocol and first draft of the manuscript. Author AVS managed the literature searches and analyses of the study. Both authors read and approved the final manuscript.

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Original Research Article

ABSTRACT

Sacred groves are important gene pools and the first major effort of the society to recognize and conserve biodiversity. In addition to preserving the biodiversity, they help in soil and water conservation. At present, the area covered by sacred groves in India is gradually declining owing to various socioeconomic factors. Like other groves of Kerala, Sacred groves of North Malabar region are also facing the threat of extinction from increasing anthropogenic activities. Sacred groves of Northern Kerala have rich and diverse flora that supports an important array of fauna. This study presents a checklist of the spider fauna in 15 the sacred groves. It is a pioneering study and no other studies done in this area. The sampling methods such as line transect method; handpicking in ground and strata, and beating were used to catch specimens. The caught specimens were preserved and identified to species and genus level using available literature. A total of 257 species of spiders belonging to 130 genera and 28 families were identified from the study area. The dominant family was Araneidae followed by Salticidae, Theridiidae, and Thomisidae, these families represent roughly the 47% of the total abundance. Five families were observed as rare in the study area with less than 2 individuals.

Keywords: Araneofauna; India; richness; sacred natural sites.

1. INTRODUCTION

Appropriate documentation of biodiversity is vital for its sustainable management and conservation by the timely monitoring of the rate of species loss. Checklists form a fundamental part of systematic documentation. Species identified from different parts of the world are added to global databases and catalogues, which form a core of taxonomy and indirectly contribute to the conservation of

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Spider diversity of Kerala University Campus, Thiruvananthapuram, Kerala, India

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ABSTRACT: A study of spider diversity of Kerala University Campus, conducted for a period of four months revealed a total of 116 species of spiders belonging to 20 families. Among the families, Salticidae was found as the most common family and among the species *Hersilia savignyi* and *Hippasa agelenoides* were found as the most common species. *Plexipus petersi, Plexipus pykulli, Xysticus minutes* and *Tibellus elongates* were also noted as the commonly found spider species.

KEYWORDS: Spider species, biodiversity, Salticidae

INTRODUCTION

Spiders make up the order Araneae in the class Arachnida. There are currently over 39,000 described species placed in 3,642 genera and 111 families. Major contributions to Indian Arachnology were made by Pocock (1895, 1899a, 1899b, 1900a, 1900b and 1901) and Tikader (1977, 1980, 1982 and 1987) who were responsible for bringing spider studies to the notice of other researchers. India's described spider fauna consists of about 1600 species, perhaps as little as half of the total spider fauna. World-wide, more than 40,000 species of spiders have been described (Uniyal *et al.*, 2011). Although more than 1,400 species have been described from India (and with many more still to be documented), the study on the taxonomy, biology and ecology of Indian spiders remain miserably inadequate. This has largely been due to lack of expertise in this field and the absence of sufficient literature (Sebastian and Peter, 2009). The present study of spider diversity was conducted in the Kerala University Campus, Kariavattom, laden with enchanting greenery covering about 350 acres of land.

MATERIALS AND METHODS

Study Site

Kerala University Campus, Kariavattom (8°32', 8°34'N and 76°52', 76°54'E) is situated about 10 km north of Thiruvananthapuram City, houses the various teaching departments under the University of Kerala. The campus covering about 350 acres of land is located on either side of the National Highway (NH 66). The elevation of the study area is about 57m MSL. The annual temperature variation ranges from 22°C to 34°C. For the purpose of the study the entire campus has been surveyed, by dividing the area into two sites. Site 1 is the

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Species composition and abundance of rotifers (Rotifera: Eurotatoria) in Thrissur Kole wetland, Kerala, India.

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ABSTRACT

Kole Wetlands are the major freshwater wetlands of Kerala, which spread over Thrissur and Malappuram districts of Kerala. They are the most productive and threatened wetlands in Kerala. Zooplanktons are heterotrophic animals; floating in the water and act as indicators for water quality. The Rotifers form a major portion of the freshwater zooplankton, serve as an important source of food for many larger aquatic organisms, and an integral part of the aquatic food web. In this context, the study on biodiversity and the abundance of rotifers was carried out from November 2017 to October 2019 from different stations of Trissur Kole wetlands. The physical and chemical parameters of the water were checked regularly for getting the data on the influence of these parameters on the rotifer's population. The highest diversity and density of rotifers recorded during the pre-monsoon season (H= 3.194, D= 0.954) followed by post-monsoon and lowest during monsoon season (H= 2.658, D= 0.898). A total of 40 species of rotifers belonging to 15 genera and 10 families were recorded. Rotifers of Thrissur Kole wetlands are dominated by Brachionidae (12 species)> Lecanidae (11 species)> Trichocercidae (5 species). Keratella cochlearis (29%) and Brachionus falcatus (25%) of the family Brachionidae are the dominant species seen during all seasons. In conclusion, Rotifers represented the important group of zooplankton throughout the current study, about 50% of the collected Rotifers were new to this area and the species richness and abundance of Rotifer shows a significant relationship with the physical and chemical parameters of the water.

INTRODUCTION

The Rotifers also called wheel animalcules (because of the presence of a wheel like organ) belong to the phylum Rotifera, form an essential part of the freshwater zooplankton and great consumer of protozoans and bacteria (**Arndt, 1993**). Thus rotifers have the power to manage the bacterial number (**Sanders, 1989**) and act as an important food sources for the majority of the fish larva (**Howell, 1973**) and cladocerans (**Burns and Gilbert, 1986**). The majority of the rotifers are microscopic and few of them having approximately 2mm can see with naked eye like rods or dots (**Sharma, 1998**). Live feeds may improve the digestion of fish larvae, therefor rotifer feeds fulfils the need for digestive and nutritional requirement for their favorable growth (**Govoni *et al.*, 1986; Lubzens, 1989**). Demolition of rotifer community indirectly upsets fish community (**Pérez-Legaspi and Rico-Martínez, 2001**). Rotifers have an important role in the aquatic ecosystem as bioindicator of water quality (**Bledzki and Ellison, 2003; Casanova, 2009**), therefore world's researchers give

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Redescription of *Asemonea cristata* Thorell, 1895 (Araneae: Salticidae: Asemoneinae), with notes on its synonymy and distribution

Переописание *Asemonea cristata* Thorell, 1895 (Araneae: Salticidae: Asemoneinae), с заметками о его синонимии и распространении

Puthoor Pattammal Sudhin[1,*], Karunnappilli Shamsudheen Nafin[1], John T.D. Caleb[2], Ambalaparambil Vasu Sudhikumar[1]
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KEY WORDS: Aranei, jumping spider, Western Ghats, Wayanad Wildlife Sanctuary.
КЛЮЧЕВЫЕ СЛОВА: Aranei, паук-скакунчик, Западные Гаты, заповедник Вэйнард.

ABSTRACT. *Asemonea cristata* Thorell, 1895 is redescribed on the basis of newly collected materials from the Western Ghats region, Kerala, India. *Asemonea picta* Thorell, 1895 and *A. santinagarensis* (Biswas et Biswas, 1992) are synonymised with *A. cristata.* Collecting localities of *A. cristata* are mapped as well.

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РЕЗЮМЕ. *Asemonea cristata* Thorell, 1895 переописан по свежесобранным материалам из региона Западные Гаты, Керала, Индия. *Asemonea picta* Thorell, 1895 и *A. santinagarensis* (Biswas et Biswas, 1992) синонимизированы с *A. cristata.* Также прокартированы точки находок *A. cristata.*

Introduction

The jumping spider genus *Asemonea* O. Pickard-Cambridge, 1869 currently comprises 25 valid species distributed mainly in Africa and Asia [WSC, 2020]. Members of this genus are small, often green or yellowish, and are usually found among leaves [Wesołowska, 2009]. *Asemonea cristata* Thorell, 1895 was described from a single male from Tharrawady in Burma (now Myanmar). We have collected the male and female of *A. cristata* during a three year long field survey in the Wayanad Wildlife Sanctuary, a part of the Southern Western Ghats of India. In the present paper, we redescribe both sexes of *A. cristata* on the basis of the fresh material. Additionally, we argue that the names *Asemonea picta* Thorell, 1895 and *A. santinagarensis* (Biswas et Biswas, 1992) are to be synonymised with *A. cristata*. The current geographic distribution of the species is mapped as well.

Materials and methods

Photos of live specimens were taken with a Canon EOS 5D Mark-III using Canon EF 100mm f/2.8 Macro USM Lens, Canon MP-E 65mm 1–5x Macro Lens and Canon MT-24EX Macro Twin Lite Flash. Spiders were collected by beating vegetation and the collected specimens were stored in 70% ethanol. Morphological examination was undertaken under a Leica M205 C stereomicroscope. The digital images were taken by means of Leica DMC4500 digital camera attached to Leica M205 C stereomicroscope, with the software package Leica Application Suite (LAS), version 4.3.0. LAS montage facility. All measurements are in mm. Measurement data for palps and legs are as follows: total length [femur, patella, tibia, metatarsus (except palp), tarsus]. The terminology follows Wanless [1980]; for leg spination the format by Bossellaers & Jocque [2000] is followed. The studied specimens are deposited in the reference collection at the Centre for Animal Taxonomy and Ecology (CATE), Department of Zoology, Christ College (Autonomous), Irinjalakuda, Kerala, India.

Abbreviations used in the text and figures are as follows: a — atrium, ALE — anterior lateral eye, AME — anterior median eye, D — described, da — dorsal apophysis, co — copulatory opening, do — dorsal, e — embolus, f — distal flange, fa — femoral apophysis, fd — fertilization duct, pl — prolateral, PLE — posterior lateral eyes, PME — posterior median eyes, plv — prolateral ventral, rl — retrolateral, RTA — retrolateral tibial apophysis, rlv — retrolateral ventral, st — subtegulum, t — tegulum, v — ventral, ZSI — The Zoological Survey of India, Kolkata.

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The first described male of the Asian jumping spider genus *Piranthus* Thorell, 1895 (Araneae: Salticidae: Baviini)

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Abstract. We give the first description of males of the jumping spider genus *Piranthus* Thorell, 1895, of the Indian species *Piranthus planolancis* Malamel, Nafin, Sudhikumar & Sebastian, 2019. Their palp is unusual in two aspects: the long embolus (longer than in most baviines) arises toward the proximal from its base before curling and proceeding distally, and the retrolateral tibial apophysis is an especially long blade. We present new illustrations of the female, and extend the range of the species from Kerala to Karnataka.

Key words. India, Salticinae, Salticoida.

Introduction

For more than a century after Thorell (1895) described the jumping spider genus *Piranthus*, it was known from only the single female and two juveniles of *P. decorus* he described from Myanmar, apart from a species misplaced in the genus (Caleb et al., 2019). Recently, *P. decorus* was discovered in Mumbai, India (Caleb & Sanap, 2017) and redescribed. Caleb & Sanap provided photographs of a living male, but did not have the specimen to describe. A second species of *Piranthus* was recently described from Kerala, *P. planolancis* Malamel, Nafin, Sudhikumar & Sebastian, 2019, likewise only from the female (Malamel et al., 2019). Here we provide the first description of a male *Piranthus*, that of *P. planolancis*, provide new images of female *P. planolancis*, and extend its range northeastward.

Material and methods

Preserved specimens were examined under both dissecting microscopes and a compound microscope with reflected light. Drawings were made by digitally tracing photographs taken using a Leica DMC4500 camera attached to Leica M205 C stereomicroscope (Kerala specimens), and a drawing tube on a Nikon ME600L compound microscope (Karnataka specimens).

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AN INVESTIGATION OF DIVERSITY AND BIOECOLOGY OF ARANEOFAUNA OF PATHIRAMANAL ISLAND IN VEMBANAD LAKE, A RAMSAR SITE, KERALA, INDIA

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Keywords:
Abundance; dominance; ecological guild; kleptoparasitic; spider

Abstract. A preliminary checklist of araneofauna of Pathiramanal Island is provided. A total of 147 species belonging to 26 families under 92 genera are documented. *Tylorida ventralis* (Thorell 1877) is considered to be the dominant species, and orb weavers are seen as the dominant guild. Araneidae, Salticidae, Theridiidae, Tetragnathidae and Thomisidae are five dominant families. The Shannon diversity, Simpson's (1-D) diversity, evenness and Chao1 indices have been calculated. Seven species new to science such as *Indopadilla insularis*, *Epeus triangulopalpis*, *Marengo sachintendulkar*, *Indomarengo chavarapater*, *Icius vikrambatrai*, *Piranthus planolancis* (Salticidae) and *Wolongia papafrancisi* (Tetragnathidae) are documented as well as three genera and four species are added to the Indian spider taxonomy. The males of *Meotipa picturara*, *Curubis tetrica* and *Pscellonus planus* are described for the first time. Eight species are synonymized and redescribed. Mating plug formation in *Argyrodes flavescens* is reported for the first time. It is noted that spider species from Pathiramanl Island bear affinities with Oriental and Palearctic regions.

INTRODUCTION

A healthy ecosystem and its smooth functioning is an indicator of the potentiality of the biodiversity of that particular ecosystem (Pettersson 1996). Pathiramanal Island seems to be a healthy ecosystem with a tower of biodiversity of both plants and animals. As far as a local legend goes, Pathiramanal Island originated as a result of divine intervention. A young Brahmin (a person belonging to the Hindu higher caste worthy of priesthood) dived into Vembanad Lake to perform his evening prayers, and the water made way for land to rise from below, thus forming the enchanting Island of Pathiramanal which means 'sands of midnight'. A great charming look, wide waterfront, flourishing coconut palms, floating weeds and hyacinths, tiny birds building nests on weeds, and varieties of rare fauna and flora among the dense foliage of this tiny Island make it really a biodiversity hotspot. But, regrettably, no previous biodiversity studies have been done in Pathiramanal Island. An informal report indicates that the Island possesses some sort of fauna like odonates, birds, mammals, reptiles and arthropods (not a precise data). Arthropod diversity in this area remains undocumented, and a pilot study disclosed that it is a refuge for a rich volume of arachnids, to which spiders make a great contribution. But no organized work has been carried out to date on the taxonomy and diversity of spiders of this biologically unique ecosystem. 23 species of spiders have been named unofficially from this ecological zone. However, it is sure that a number of spiders have yet to be explored in this ecosystem, which prompts the need for an inventory of the spider fauna of this unique environmental sector. As spiders free us from most of insect pests like a key component to balancing the ecosystem both as prey and predator, they are very important animal taxa for humans (Benítez and Méndez 2011). In order to understand the potentiality of the Island and to conserve the spider species there, it is essential to explore the Island comprehensively. Therefore, this study is an attempt to throw light on the diversity, richness, abundance and dominance of spiders in Pathiramanal Island.

MATERIALS AND METHODS

Study Area

Pathiramanal Island (hereinafter, Island) is a small tropical island with an area of approximately 1 km^2. It lies between the latitudes 9°37'07.11" N and longitudes 76°23'04.95" E (Figure 1). Though small in size, Pathiramanal Island is blessed with rich flora and fauna owing to the presence of a wide forest cover and thick vegetation (Figure 2). With respect to its geographical, climatic and ecological features, the Island harbours a rich amount of arachnids, of which spiders have a huge share. The temperature ranges from 28.6° C to 33.5° C, with an annual mean of 31.0° C and plentiful rainfall in June–July (annual rainfall > 250 mm). The dense vegeta-

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Diversity and population fluctuation of jumping spiders (Araneae: Salticidae) of Calicut University campus, Kerala, India

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[2] Centre for Animal Taxonomy and Ecology, Department of Zoology, Christ College, Irinjalakuda, Kerala-680125, India
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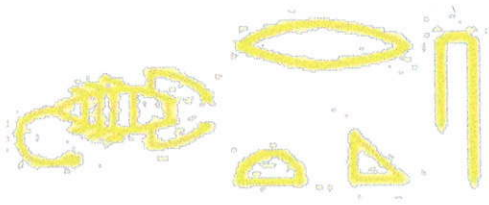
Abstract

Salticidae, also known as jumping spiders, is the largest spider family. They are strongly influenced by habitat type. Here we describe the diversity and seasonal variation of jumping spider fauna of Calicut University campus, which spread over 500 acres. This study was conducted for ten months and spiders were collected by hand picking method and beating method. A total of 46 species of jumping spiders coming under 33 genera were collected. A taxonomically complete inventory of species, with good taxonomic resolution, is an advantageous feature that can be used in the analysis of species diversity and has great potential in setting conservation priorities, and support for environmental monitoring. Besides, this taxonomic information can be used to measure β-diversity, based on taxonomic dissimilarity coefficients for presence/absence data, regardless of the sampling effort. In this way, checklist or faunistic studies demonstrate a clear connection between basic taxonomy and biodiversity issues; and, as in other fields, these inventories provide an important source of quantitative compiled information concerning species diversity of several regions.

Keywords: Checklist, Jumping spider, Faunistic inventory, Seasonal variation, Biodiversity conservation, India.



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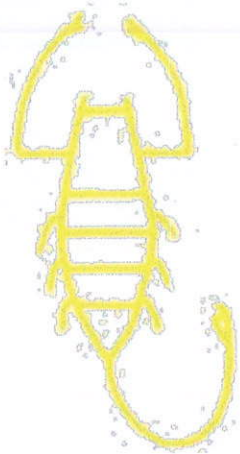

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A Safer, Wide-Temperature Liquefied Gas Electrolyte Based on Difluoromethane

Daniel M. Davies [a], Yangyuchen Yang [b], Ekaterina S. Sablina [a], Yijie Yin [b], Matthew Mayer [b], Yihui Zhang [a], Marco Olguin [a], Jungwoo Z. Lee [e], Bingyu Lu [a], Dijo Damien [f], Oleg Borodin [c,d,***], Cyrus S. Rustomji [e,**], Y. Shirley Meng [a,b,g,*]

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HIGHLIGHTS

- Demonstration of unique safety feature inherent to liquefied gas electrolytes.
- Low flammability, difluoromethane based solvent enables wide temperature operation.
- Raman spectroscopy reveals few free co-solvent molecules and high salt aggregation.
- MD simulations compliment experimental results with insight into Li^+ transportation.
- Li.|Cu plating/stripping and full cells operational through a wide temperature range

ARTICLE INFO

Keywords:
Safety
Liquefied Gas Electrolyte
Solvation Structure
Lithium Metal

ABSTRACT

Development of safe electrolytes that are compatible with both lithium metal anodes and high-voltage cathodes that can operate in a wide-temperature range is a formidable, yet important challenge. Recently, a new class of electrolytes based on liquefied gas solvents has shown promise in addressing this issue. Concerns, however, have been raised on the pressure, flammability and low maximum operating temperature of these systems. Here, we endeavor to mitigate safety and practicality concerns by demonstrating an enhanced safety feature inherent in liquefied gas electrolytes and by showing the viability of using difluoromethane as a liquefied gas solvent which has lower pressure, lower flammability, and improved maximum operation temperature characteristics compared with fluoromethane. We create a custom-built setup to enable liquefied gas electrolyte characterization through Raman spectroscopy and supplement this with molecular dynamics (MD) simulations. The electrolyte shows good conductivity through a wide temperature range and compatibility with both the lithium metal anode and 4 V class cathodes. The demonstrated use of such alternative liquefied gas solvents opens a path towards the further development of high-energy and safe batteries that can operate in a wide-temperature range.

1. Introduction

Batteries are ubiquitous today in a vast number of applications. They vary greatly in size and application, from portable electronics to providing energy storage for grid reliability and resiliency. The front running chemistry for a number of these applications is the

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Daniel M. Davies [a], Yangyuchen Yang [b], Ekaterina S. Sablina [a], Yijie Yin [b], Matthew Mayer [b], Yihui Zhang [a], Marco Olguin [a], Jungwoo Z. Lee [e], Bingyu Lu [a], Dijo Damien [f], Oleg Borodin [c,d,***], Cyrus S. Rustomji [e,**], Y. Shirley Meng [a,b,g,*]

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Development of safe electrolytes that are compatible with both lithium metal anodes and high-voltage cathodes that can operate in a wide-temperature range is a formidable, yet important challenge. Recently, a new class of electrolytes based on liquefied gas solvents has shown promise in addressing this issue. Concerns, however, have been raised on the pressure, flammability and low maximum operating temperature of these systems. Here, we endeavor to mitigate safety and practicality concerns by demonstrating an enhanced safety feature inherent in liquefied gas electrolytes and by showing the viability of using difluoromethane as a liquefied gas solvent which has lower pressure, lower flammability, and improved maximum operation temperature characteristics compared with fluoromethane. We create a custom-built setup to enable liquefied gas electrolyte characterization through Raman spectroscopy and supplement this with molecular dynamics (MD) simulations. The electrolyte shows good conductivity through a wide temperature range and compatibility with both the lithium metal anode and 4 V class cathodes. The demonstrated use of such alternative liquefied gas solvents opens a path towards the further development of high-energy and safe batteries that can operate in a wide-temperature range.

1. Introduction

Batteries are ubiquitous today in a vast number of applications. They vary greatly in size and application, from portable electronics to providing energy storage for grid reliability and resiliency. The front running chemistry for a number of these applications is the

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INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

"CULT BRAND" WITH SPECIAL REFERENCE TO ROYAL ENFIELD BIKES

Dr. Arun Balakrishnan

Assistant Professor, Dept. of Commerce, Christ College, Thrissur, Kerala.

ABSTRACT

A **CULT** is group of people defined by a "religious" devotion to something — often a self-appointed leader. Most people view cults as strange and frightening because cults have, over the years, done some strange and frightening things, including murders and mass suicides. Sometimes, too, you'll see *cult* used as an adjective to describe something or someone with a small, devoted fan-base. John Water's movies are cult favorites, adored by a select group of film lovers but not by the public at large. An type of huge emotional attachment towards something or someone is termed as Cult. In the United States there are cult groups especially for products and services. Apple and Harley Davidson are some of the examples. Here in India Royal Enfield Bikes have captured the hearts of the people especially the youth. Many boys as well as girls have bought the Royal Enfield bullet. Royal enfield bikes have become a sensation and a devotion like thing for the people who have it. Therefore the researcher has attempted to study on Cult Branding especially on Royal Enfield Bikes.

Key Words – Cult, Brand, Royal Enfield

INTRODUCTION

Marketing is the action or business of promoting and selling products or services, including market research and advertising. A product can be either tangible or intangible service that fulfils a need of consumers. Whether you sell custom pallets and wood products or provide luxury accommodations, it's imperative that you have a clear grasp of what exactly what your product is and what makes it unique before you can successfully market it. Once a concrete understanding of the product offering is established, we can start making some pricing decisions. Price determinations will impact profit margins, supply, demand and marketing strategies. Similar (in concept) products and brands may need to be positioned differently based on varying price points, while price elasticity considerations may influence our next two Ps.

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INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A study on Emotional Intelligence and teaching effectiveness among teachers in Kerala

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Assistant Professor

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Abstract:

Emotional Intelligence may be relatively a new term which have a wider acceptance in the modern era. The term emotional intelligence was first coined by Peter Salovey and John Mayor in 1990s. It refers to the ability to recognize regulate emotions in our self and others to make effective decision. The concept of EI get popularized after the publication of Daniel Goleman's book "Emotional Intelligence-why it can matter more than IQ?". EI is defined as the " the ability to monitor one's own and others feelings and emotions to discriminate among them and to use this information to guide ones thinking and action". Emotional Intelligence has conceptualized in four broad abilities such as perceiving, assimilating, understanding, and managing emotions. The person who can manage the emotions and understand the feelings of other people perform better in school, college, and on their jobs. The success and chance of the productive life of a student are directly dependent on the educator. Teachers lay the foundation stone for the social, emotional, and intellectual potentialities of the learner and also accounts for the success in teaching and learning and welfare of the students. Hence it is imperative to assess the Emotional Intelligence of teachers. This study is an effort to know whether the present day teachers have EI skills, whether they are using it. This study will help in bringing awareness about Emotional Intelligence and its effectiveness.

Key words: Emotional Intelligence, intellectual potentialities, teaching effectiveness

1.1 Introduction

Teachers are the most important resource in education reconstruction. Teaching effectiveness is the extent to which the teaching activity fulfils its intended purpose, function, and goals. According to Goleman, Emotionally Intelligent teacher is creating a safer and more satisfying, caring, and productive school environment. Emotional Intelligence is useful in any place where interpersonal relationships are generated- schools, workplaces, home and other organisational settings. The study involves understanding the effect of emotional intelligence on effective teaching. This study is an effort to know whether the present day teachers have EI skills, whether they are using it. This study will help in bringing awareness about Emotional Intelligence and its effectiveness.

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INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

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STUDY ON EFFECT OF E-LEARNING PROCESS DURING COVID 19 PANDEMIC

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[2]Thomas Lal , M Com Student, Christ College (Autonomous) Irinjalakuda

Abstract

The present study emphasizes the global impact of the e-learning process during COVID 19. The implementation of lockdown and social distancing has been enforced as one of the preventive measures to spread the coronavirus infection which has resulted in complete paralysis of global activities. Especially the education system which is completely shut and to proceed with the academic curriculum, there is a shift from the regular learning process to electronic learning. This can be cited with an increased number of online classes, conferences, meetings, etc. It can be noted that the world is completely dependent on information technologies during this crisis. Hence, the present study provides an insight into the process of electronic learning and its advantages along with the updated version of its usage. To the best of our knowledge, there have been scanty scientific reports on this particular situation of the impact of e-learning during COVID 19. The present study is a compilation of the components of e-learning tools along with the future perspective on education using information science.

Keywords: E-learning, COVID 19, Global platform, Google apps, online learning

1.1Introduction

During the present pandemic crisis when the entire globe is sailing amid the storm, technology has played a pivotal role. Technological development and the internet have changed the lives of people immensely and have also brought a huge change in various fields (Nadikattu,2020). Especially in the education system E-learning has been found to be a significant tool for effectively continuing the teaching-learning process during the lockdown. The web has become one of the important mediums of learning that opens the door for people around the world to access education easily at free or lesser cost (Noor-Ul-amin, 2013). E-learning has fixed its root specially in the field of modern education. The need of modern learners is quite different and e-learning has been found beneficial for fulfilling their needs. The mediums of E-learning and principles of artificial intelligence are gradually gaining popularity in the world (Misko et al., 2004; Soni, 2020). It is providing a solution to the learners who are unable to access the traditional means of education due to the present pandemic situation. The

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ORIGINAL ARTICLE

Activated carbon derived from ground nutshell as a metal-free oxygen reduction catalyst for air cathode in single chamber microbial fuel cell

Karthick S[1] · Vishnuprasad S[1] · Haribabu K[1] · Manju N J[2]

Received: 17 October 2020 / Revised: 7 January 2021 / Accepted: 26 January 2021

Abstract
A single-chamber microbial fuel cell (SCMFC) was constructed using activated carbon derived from ground nutshells (GAC) as a metal-free cathode catalyst. The prepared cathode catalyst was characterized by X-ray photoelectron spectroscopy (XPS), Brunauer-Emmett-Teller (BET), and Field emission scanning electron microscopy (FE-SEM), which demonstrates the chemical composition and the surface morphology of the synthesized material. The electrochemical characteristics of the cathode were investigated by electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV) analysis, which confirmed the high charge transfer capacity and catalytic activity property of GAC catalyst material. The MFC with GAC catalyst produces a maximum output voltage of 0.619 V and which is 1.61 times greater than that of bare carbon cloth (CC). For Pt/C and GAC-modified CC, high power density values of 0.763 W m^{-2} and 0.521 W m^{-2} were obtained at current densities 1.65 A m^{-2} and 1.0 A m^{-2}, respectively at 100 Ω. These results demonstrate that the GAC/CC is a promising cost-effective cathode catalyst for SCMFC.

Keywords Microbial fuel cell · Ground nutshells · High charge transfer · Catalytic activity

1 Introduction

Over the past several years, there has been a drastic increase in energy demand due to the tremendous growth in the global population and energy requirements [1]. This increase in demand has led to the injudicious exploitation of non-renewable sources of energy. The improper use of these resources had severe implications for the environment. Not only has there been an increase in the pace of depletion of these resources, but there has also been an increase in the emission of greenhouse gasses and subsequent issues such as global warming and climate change. The greenhouse gas emissions (GHG) sources are mainly divided into five sectors according to the Environmental Protection Agency (EPA) such as electricity and heat (28%), industry (22%), agriculture (9%), residential (12%), and transportation (29%) [2, 3]. Therefore, it is essential to find environmentally friendly and renewable energy alternatives to alleviate the levels of pollution and restore nature's resources sustainably [4]. To effectively substitute the use of non-renewable sources of energy, the alternatives suggested must also be economically viable and accessible for use. One such energy technology environmentally friendly and sustainable energy is the microbial fuel cell (MFC) [5]. An MFC is a bioelectrochemical device capable of simultaneous energy generation and wastewater treatment by converting organic material present in wastewater into electrical energy using microorganisms as biocatalysts [6]. During the conversion, both electrons and protons are generated in the anodic chamber of the MFC. The electrons travel through an external circuit, thereby producing an electric current. The protons travel across a proton exchange membrane to the cathodic chamber, wherein it combines with an oxygen receptor to form water through the four-electron pathway (O_2 to H_2O) [7]. Therefore, MFCs are a promising alternative to environmentally hazardous, non-renewable sources of energy. However, its successful commercialization is still limited by its low power output and high cost [8]. The reason for these

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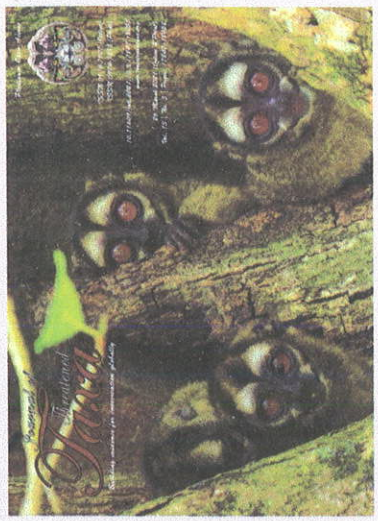

COMMUNICATION

DRAGONFLIES AND DAMSELFLIES (INSECTA: ODONATA) OF THE KOLE WETLANDS, CENTRAL KERALA, INDIA

A. Vivek Chandran, Subin K. Jose & Sujith V. Gopalan

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DOI: 10.11609/jott.5885.13.3.17963-17971

Human–wildlife interactions and people's attitudes towards conservation: a case study from Central Kerala, India

S. K. Govind, E. A. Jayson

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Abstract

Human–wildlife interactions and people's attitudes towards conservation: a case study from Central Kerala, India. This paper studies the human–wildlife interaction in Central Kerala, India, and attempts to understand local people's attitude toward wildlife and conservation. Data were collected from April 2009 to March 2014. A structured questionnaire survey was carried out among people living in the fringe areas of the forest (n = 210). Self–reported household crop loss was modelled as a function of agricultural, demographic and environmental factors. Wild pig (*Sus scrofa*) (57.1%) was the main crop foraging species, followed by Asian elephant (*Elephas maximus*) (12.9%). It was reported that 36% of farmers' annual income was lost due to crop foraging by wild animals. Leopard (*Panthera pardus*) (69.76%), Indian rock python (*Python molurus*) (13.95%), dhole (*Cuon alpinus*) (9.3%) and stray dogs (6.97%) were responsible for the attacks on livestock. The factors that influenced crop loss according to the farmers were the extent of agriculture land that they owned (coefficient = 0.968), the distance to reserve forest from crop fields (–0.009), and age of respondents (0.78). Due to people's awareness concerning the importance of wildlife, reports on human–wildlife interaction in the newspapers and strict enforcement of wildlife laws, people's attitude towards conservation of wildlife was good, and they were not taking any negative precautions against wild animals.

Key words: Human–wildlife interaction, Wildlife conservation, Wildlife management

Resumen

La interacción entre los humanos y la fauna silvestre y la actitud de las personas en relación con la conservación de la fauna silvestre: un estudio de casos en Kerala central, en la India. El presente artículo estudia la interacción entre los humanos y la fauna silvestre en Kerala central, en la India, y trata de entender la actitud de las personas en relación con la conservación de la fauna silvestre. Los datos se recopilaron entre abril de 2009 y marzo de 2014. Se llevó a cabo una encuesta estructurada entre la población que habita en los márgenes de las zonas forestales (n = 210). Se elaboró un modelo de la pérdida de cultivos comunicada por los hogares como una función de factores agrícolas, demográficos y ambientales. El cerdo (*Sus scrofa*) era la principal especie que se alimentaba de los cultivos (57,1%), seguida del elefante asiático (*Elephas maximus*) (12,9%). Se comunicó que el 36% de los ingresos anuales de los agricultores se perdió a causa de los animales silvestres. El leopardo (*Panthera pardus*) (69,76%), el pitón de la India (*Python molurus*) (13,95%), el perro salvaje asiático (*Cuon alpinus*) (9,3%) y los perros callejeros (6,97%) atacaron al ganado. La superficie de tierra agrícola propiedad de agricultores que habitan en los márgenes (el coeficiente es de 0,968), la distancia de la parcela de cultivo a la reserva forestal (–0,009) y la edad de los encuestados (0,78) fueron los factores significativos que influyeron en la pérdida de cultivos comunicada por los agricultores que habitan en los márgenes del bosque. Debido a la concienciación de la población acerca de la importancia de la fauna silvestre, los artículos de prensa sobre la interacción entre los humanos y la fauna silvestre y el cumplimiento estricto de la legislación en materia de vida silvestre, la actitud respecto de la conservación de la fauna silvestre era buena y no se estaban tomando precauciones negativas contra los animales silvestres.

Palabras clave: Interacción entre humanos y fauna silvestre, Conservación de la fauna silvestre, Gestión de la fauna silvestre

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First record of *Menemerus marginatus* (Kroneberg, 1875) (Araneae: Salticidae: Chrysillini) from India

Rishikesh Tripathi[1], Ashish Kumar Jangid[2,3], Manju Siliwal[2], Sutirtha Dutta[2] and Ambalaparambil Vasu Sudhikumar[1]

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Abstract. The jumping spider *Menemerus marginatus* (Kroneberg, 1875) is reported for the first time from India, from the Desert National Park in Rajasthan. The male and female *M. marginatus* are redescribed from Indian specimens and the known distribution of this species, in southwestern Asia, is mapped.

Keywords. Desert National Park, distribution, jumping spider, Rajasthan

The genus *Menemerus* (Simon, 1868) is most diverse on the African, Asian, and European continents (Mariante & Hill, 2020). Presently this genus includes 65 species worldwide. Of these, *M. albocinctus* (Keyserling, 1890), *M. brachygnathus* (Thorell, 1887), *M. brevibulbis* (Thorell, 1887), *M. fulvus* (L. Koch, 1878) and *M. nigli* (Wesołowska & Freudenschuss, 2012) are known from India (Keyserling, 1890; Jastrzębski, 1997; Roy et al., 2016; Chatterjee et al., 2017; World Spider Catalog, 2021). During a recent *Arachnological Diversity Assessment* of the Desert National Park Wildlife Sanctuary of Rajasthan, India, three *Menemerus* spiders were collected. Later, we identified these as *M. marginatus* (Kroneberg, 1875) through the use of taxonomic keys provided by Wesołowska et al. (2011) and Bauer et al. (2015).

The known distribution of *Menemerus marginatus* includes parts of Afghanistan, Azerbaijan, Central Asia (southwestern European part of the former USSR, to include Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan), Iran, Pakistan, and the United Arab Emirates (Figure 1; World Spider Catalog, 2021). This new record (Figure 1: locality 32) extends the known distribution of this species in southwestern Asia to the southeast, into India. As previously suggested (Pook et al., 2009; Linder et al. 2017), climatic conditions in the Thar Desert that divides India and Pakistan are similar to those in contiguous, arid areas of southwestern Asia, and this area can be expected to harbor species previously found only to the north and west.

Corrigendum to "Coconut inflorescence sap enhances exercise performance and plasma antioxidant status in young active men" [NFS Journal 23 (2021) 37–43]

Ashish Joseph [a], Svenia P. Jose [b], Bintu T. Kalyan [c], Renny R. Mammen [d], I.M. Krishnakumar [d], Bradley S. Fleenor [e], Ratheesh Mohan [b]

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Available online 13 May 2021.

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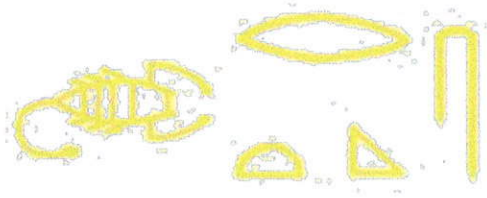

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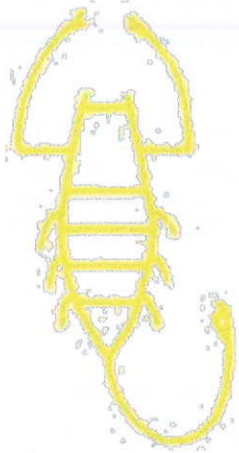

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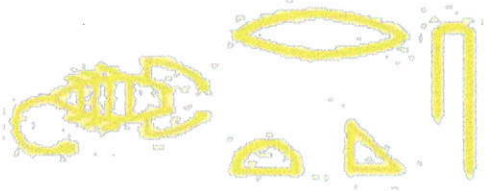

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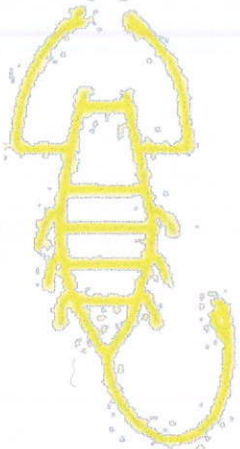

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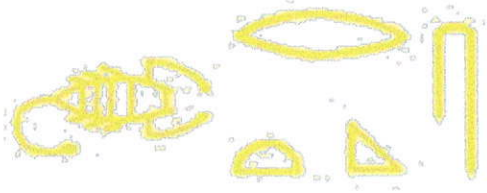

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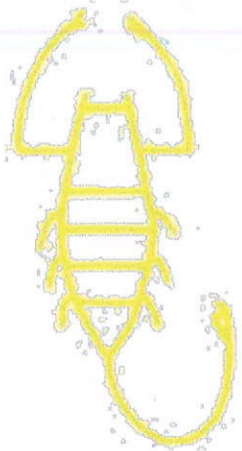

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Compaction study of food powders using metamaterial split ring resonator based sensor

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P. V. Aswathi, Anju Sebastian, Sikha K. Simon, C. Bindu, V. P. Joseph, and Jolly Andrews

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First record of *Menemerus marginatus* (Kroneberg, 1875) (Araneae: Salticidae: Chrysillini) from India

Rishikesh Tripathi[1], Ashish Kumar Jangid[2,3], Manju Siliwal[2], Sutirtha Dutta[2] and Ambalaparambil Vasu Sudhikumar[1]

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Abstract. The jumping spider *Menemerus marginatus* (Kroneberg, 1875) is reported for the first time from India, from the Desert National Park in Rajasthan. The male and female *M. marginatus* are redescribed from Indian specimens and the known distribution of this species, in southwestern Asia, is mapped.

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Seawater Intrusion in Coastal Areas from Poovar to Shangumugham, Thiruvananthapuram District, Kerala, India

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Abstract

The coastal aquifers in Kerala are experiencing seawater intrusion due to overexploitation in order to meet the demand of the growing population. Only a few studies have been done in the present study area. So, a study was conducted on coastal aquifers from Poovar to Shangumugham, Thiruvananthapuram district, Kerala state in order to find out the status of seawater intrusion in the area. Groundwater samples were collected and the quality and impact of saltwater intrusion were studies by determining the geochemical characters of 78 groundwater samples collected during pre-monsoon and post-monsoon each. Physical parameters and chemical parameter major cations and anions were determined. The data were analyzed and the multivariate analysis was carried out using SPSS 24. The correlation and R-mode factor analysis confirms the presence of seawater intrusion and using Q-mode factor analysis the areas affected by seawater intrusion were demarcated. Thus, the groundwater of the study area has to be managed sustainably considering the geochemical nature and their seasonal variations, as region proposed for study is a coastal fragile environment.

Keywords : Salt Water Intrusion, Coastal Aquifers, Poovar-Shangumugham, Groundwater, Kerela

Introduction

According to Centre for Coastal Zone Management and Coastal Shelterbelt data an appreciable amount of population lives on the coastal zones of India, which fluctuates depending on the season as most coastal areas are tourism hotspots and they depend primarily on groundwater for their needs since in these area's water is available with considerable ease. The overexploitation of groundwater in the coastal aquifers in order to meets the requirement of the growing population led to the introduction of saltwater to the fresh groundwater which is not a good scenario. The increasing trend towards the coastal tourism and improper management of the resource add the misery. Many studies indicated that the coastal groundwater system of Kerala experiences setbacks in terms of quality and quantity (Dipanjali, 2000; CGWB, 2002; Kunhambu, 2003; Laluraj *et al.*, 2005; CGWBKR 2007; Manjusree *et al.*, 2009; Prasanth *et al.*, 2012; Boominathan *et al.*, 2012; Sarath *et al.*, 2012; Priju *et al.*, 2012; Priju *et al.*, 2014; Anil-Kumar *et al.*, 2015; Midhun *et al.*, 2017; Sreekesh *et al.*, 2018; Pramada *et al.*, 2018). So, it is so important to assess the vulnerability of the aquifer to seawater ingress and only a few studies have been done in the present study area. So, the main purpose of the study is to understand the present hydrogeological situation along the coastal stretches extending from Poovar to Shangumugham in Trivandrum district of Kerala state and grade the area based on vulnerability of aquifers towards intrusion of seawater for which multivariate statistical analyses act as a reliable method (Akbal *et al.*, 2011).

Study Area

The study area is located in the coastal regions of Thiruvananthapuram district, Kerala state. The study area extends from coastal aquifers of Poovar to Shangumugham. The district is one of the rapidly developing areas in Kerala and also hosts its capital. The study area extends to 100sq.km and is located in the western coast of India which experiences a humid tropical climate. The annual variation of mean air temperature is from 21°C to 34°C with average annual rainfall is about 2035mm. The area lies in the low land or coastal plain and dominated by Sandstone and Silt together with Sand and silt with patches of Laterite, Charnockite and Khondalite group of rocks. The laterites are secondary

Habitat modelling of Odonata of Irinjalakuda ponds, central Kerala, India

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Abstract: Dragonflies and damselflies (Insecta: Odonata) were sampled in 20 randomly selected ponds in Irinjalakuda municipality, Kerala, southern India during November 2019-February 2020 using Visual Encounter Surveys (VES). Their diversity was tested for correlation with 13 habitat parameters measured. Species distribution density maps were generated using ArcGIS 10.3.

Introduction

Dragonflies and damselflies which belong to the insect Order Odonata are considered as vital components of freshwater ecosystems and good indicators of ecosystem health because of their amphibious life history, relatively short generation time, high trophic position and diversity (Corbet 1993). Ponds are home to a diverse community of specialized plants and animals and are hence of great conservation concern. Through land-use changes, ponds have been disappearing rapidly and the remaining ponds are often threatened by contamination

1st June 2021

First record of gynandromorphism in *Trithemis aurora* (Odonata: Libellulidae)

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Abstract. A gynandromorphic individual of *Trithemis aurora* is reported from a garden in Palakkad district, Kerala state, India. Its eyes, thorax, legs, wings, and abdomen show mosaic gynandromorphy. The abdomen is mostly gynochromic with the tip bearing female appendages. Detailed study of the specimen shows that female characters predominate but significant areas exhibit male characters.

Further key words. Dragonfly, Anisoptera, mosaic gynander, androchromism

Introduction

Gynandromorphs are genetically chimeric individuals consisting of adjacent male and female tissues, thus differing from intersexes which are genetically uniform (NARITA et al. 2010). Gynandromorphism is a rare phenomenon in nature and is readily detected in species that show sexual dimorphism. In arthropods, gynandromorphs have been recorded in crustaceans (FARMER 2004), arachnids (*e.g.*, PALMGREN 1979; COKENDOLPHER & SISSON 1988; LABRUNA et al. 2002) and insects (*e.g.*, MORGAN & BRIDGES 1919; NIELSEN 2010; GJERSHAUG et al. 2016). In dragonflies, gynandromorphism has been reported in at least 55 cases (*cf.* review by MARTENS & WILDERMUTH 2021). This phenomenon is conspicuous in species that exhibit marked sexual colour dimorphism such as *Crocothemis servilia* (Drury, 1770) (YOKOTA & ASAHINA 1953; FUTAHASHI 2017; RENJITH & CHANDRAN 2020), *Brachythemis contaminata* (Fabricius, 1793) (JOSHI et al. 2020) or *Neurothemis tullia* (Drury, 1770) (SHOME et al. 2019). Here we report on a case of phenotypical mo-

A Comparative Study of Odonate Diversity in Lentic and Lotic Habitatsof Wayanad, the Western Ghats, India

A.Vivek Chandran[1], Rose Maria Sebastian[2], Subin K. Jose[3*], Koshy P.M[4]

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*Corresponding author

Abstract: Two sites, one pond and a stream in Wayanad district, Kerala, India were monitored for a period of three months.The diversity of Odonata (dragonflies and damselflies) in the sites was studied using visual encounter surveys (VES). A total of 29 species of odonates from eight families were recorded during the study and the lentic system (pond) was more diverse in terms of odonate species. The pond ecosystem supports more generalist (eurytopic) species while the stream has many specialist (stenotopic) species.

Key words: Endemic, biodiversity, insect ecology, conservation

Introduction

The life history of odonates is closely linked with water bodies. They use a wide range of flowing and stagnant water bodies. Even though most species of odonates are highly specific to a habitat, some have adapted to urban areas and make use of man-made water bodies. Habitat specificity has an important bearing on the distribution and ecology of odonates (Clark &Samways 1996).Odonates lay their eggs in all type of aquatic habitats, from still stagnant water to fast flowing rivers to water collected in tree-holes.The larvae are completely aquatic and effective predators.Newly emerged odonates leave their emergence site and inhabit nearby landscape.Adult dragonflies are aerial predators and catch insects like mosquitoes, midges, butterflies, moths, bees and odonates on flight.Adult odonates feed on mosquitoes, blackflies and other blood-sucking flies and act as an important biocontrol agent of these harmful insects.Long term conservation of odonates and other freshwater biota can only be assured through appropriate national level policy interventions and definite freshwater biodiversity conservation programmes(Francisco &Wyckhuys 2019).The study of biodiversity of odonates in different habitats help us to get an idea about characteristics and functioning of the ecosystem.Also, such odonatological studies provide information about their suitability as bioindicators and their relationship with the environment (Hassal 2005). There has been a renewed interest in the study of odonates in Kerala after the publication of many field guides. Adarsh et al. (2014) studied the odonate diversity of Kerala Agricultural University campus and Chandran et al. (2020, 2021) reported 30 species from the man-made ponds of Irinjalakuda and 44 species from the Kole wetlands

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ORIGINAL PAPER

Electrochemical lithium and sodium insertion studies in 3D metal oxy-phosphate framework $MoWO_3(PO_4)_2$ for battery applications

M. Satyanarayana[1,2] · Ediga Umeshbabu[3] · A. K. Jibin[4] · Joseph James[1] · P. Justin[5] · U. V. Varadaraju[1]

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Abstract

A new type of three-dimensional (3D) oxy-phosphate materials are explored for the application of Li and Na batteries. The molybdenum tungsten oxy phosphate, $MoWO_3(PO_4)_2$, was synthesized by solid-state method and evaluated for Li/Na insertion/de-insertion electrode material for the first time. The cell at charged state (vs. Li^+/Li) showed a discharge capacity of 786 mAh g^{-1} within the voltage window of 0.3 V with amorphization of crystalline $MoWO_3(PO_4)_2$ as observed from ex-situ powder XRD analysis. The structural integrity was revealed in this material, even with nearly more than 5 Li^+ ions into the lattice, leading to the discharge capacity of 250 mAh g^{-1}. The reversible charge/discharge behavior with insertion/de-insertion of 2.4 Li^+ ions in the voltage range of 1.65 – 3.5 V resulted in 110 and 95 mAh g^{-1} at C/10 and C/5 rates, respectively. On the other hand, poor cycling performance was noticed for Na ion insertion and desertion, with a discharge capacity of 250 mAh/g within the voltage range of 0.3 – 3.5 V (vs. Na^+/Na).

Keywords $MoWO_3(PO_4)_2$ · X-ray diffraction · Li and Na insertion · Electrochemical properties

Introduction

Lithium insertion and de-insertion in tungsten and molybdenum-based oxides have been extensively studied for Li and Na-ion batteries. The reported phases of molybdenum/tungsten oxides and alkali molybdenum/tungsten oxides include MoO_3, WO_3, A_xMoO_3 (A = Li, Na), Li_2MoO_3, and $Li_5Mo_5O_{12}$ [1–4]. These oxides showed Li-ion insertion and de-insertion of 2 to 3 Li ions into and from the structure, respectively, in the voltage range of 0.5 – 4.3 V [4–6]. Recently, the triclinic $Li_4Mo_5O_{17}$ phase (space group, $P-1$) reported by Pop et al. has edge shared MoO_6 polyhedra, resulting in a ribbon type structure. The insertion of 7 Li-ions into the triclinic $Li_4Mo_5O_{17}$ phase result in a rock salt type $Li_{11}Mo_5O_{12}$ phase. De-insertion of 7 Li-ions shows the formation of the parent phase, cycled at a C/100 rate in the voltage window of 2.2 – 3.0 V [7]. The garnet framework compound, $Li_3Nd_2W_2O_{12}$, has been explored for Li-ion batteries and shows the possibility of reversible insertion and de-insertion of Li ions.

New polyanionic materials, especially phosphate-based compounds, are considered structurally and thermally resistant during charge/discharge cycling with fast diffusion of Li and Na ions [8, 9]. For instance, $LiFePO_4$ with olivine structures is the best example of the cathode material of choice for Li-ion battery applications in plug-in hybrid electric vehicles. This is because of its structural integrity and thermal and interface stability during fast diffusion of Li ions at high rate capability [9–11]. NASICON-type materials like $A_3Fe_2(PO_4)_3$ (A = Li or Na), $V_2(SO_4)_3$ [12, 13], and the oxy polyanionic framework compounds such as Li_xMOXO_4 (M = V and Ti; X = S, P and Si) and both α and β forms of $NbO(PO_4)$ have been widely explored as cathode materials recently for Li and Na-ion batteries [14–17]. Due to the availability of easily accessible sites for the intercalated ions to occupy and the presence of metal atoms that

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Subject: [JBNHS]Accept for 4th revised ms 148822 Delete

Sir,

The 4th revised draft of the manuscript 148822 titled 'PREDATORY ATTACK OF COMMON LEOPARD (PANTHERA PARDUS) ON HUMANS AND LIVESTOCK IN CENTRAL KERALA, INDIA' has been accepted for the JBNHS publication under Miscellaneous Notes section.

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A simple method for the synthesis of anatase-rutile mixed phase TiO_2 using a convenient precursor and higher visible-light photocatalytic activity of Co–doped TiO_2

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ABSTRACT

This work reports a novel and simple method for the synthesis of mixed phase TiO_2 (Anatase 70% and Rutile 30%). Refluxing aqueous solution of potassium titanyl oxide oxalate lead to direct crystallization of titanium oxalate complex $[Ti_2O_3(H_2O)_2(C_2O_4).3H_2O]$ and this complex on calcination at 450 ℃ for one hour yielded TiO_2 powder. The powder samples were characterized by XRD, Raman spectroscopy, FESEM-EDX, TEM, XPS, FT-IR, UV–Visible spectroscopy and BET techniques. The XRD, TEM and Raman spectra of TiO_2 indicates the coexistence of anatase and rutile phases. The XRD result shows that the primary particle size of anatase crystals is 8.3 nm and that of rutile crystals is 35 nm. From the UV–Visible DRS spectrum, the bandgap of TiO_2 was found to be 3.0 eV. Co–doped TiO_2 (Co:Ti ratio 1:99) was prepared by adding cobalt nitrate to the precursor solution. On Co–ion doping, anatase:rutile composition was changed to 84:16. The visible light photocatalytic activity of Co–doped TiO_2 was found to be better than that of undoped and Degussa TiO_2 due to higher visible light absorption caused by Co^{2+} energy levels due lowered bandgap.

Selection and Peer-review under responsibility of the scientific committee of the Global Conference on Recent Advances in Sustainable Materials 2021.

1. Introduction

Nanoparticles exhibit unique physical, chemical, and biological properties relative to bulk materials due to their large surface area and quantum confinement effect. They have tremendous applications as basic building blocks in the field of nanotechnology for various practical applications. The nanomaterials and their complexes with organic ligands have been widely studied for the degradation of pollutants, catalysis, as antibacterial and antifungal agents, for the extraction of poisonous metal ions, in hydrogen storage etc [1-7]. Various techniques have been reported to prepare nanomaterials in different shapes like nanoflower, nanosquare, nanohexagon, nanowires have been reported by many groups [8-10].

In recent years, TiO_2 has been explored for diverse applications such as pigments, sensors, photocatalysts, energy storage devices, solar cells etc [11-16]. It is a promising semiconductor material due to its commercial availability, chemical and thermal stability, low cost, non toxicity, and ease of handling [17,18]. TiO_2 belongs to n-type semiconductor. Titania can exist in three crystalline phases, *viz* anatase, rutile and brookite and these phases are having bandgap energy of 3.2 eV (380 nm), 3.0 eV (415 nm) and 3.6 eV (344 nm) respectively [19]. Controlled crystallisation of TiO_2 from solutions is a prerequisite for preparing high quality TiO_2 nanopowder [20]. Rutile phase is difficult to obtain at low temperature and it is usually prepared by calcinations of anatase at higher temperature [21,22]. The high temperature leads to agglomeration and larger particle size [23,24]. Rutile has also higher chemical stability and higher refractive index compared to anatase [25,26]. Zhang and Banfield demonstrated that the rutile is more stable than anatase but the stability reverses when the particle size is less than 14 nm [27]. There are several methods for the preparation of TiO_2. Most of the traditional methods involved corrosive precursors or complicated and expensive equipments. The reflux method is comparatively easy and has potential to fabricate TiO_2 with controlled morphology. It needs simple equipment, environmentally friendly process conditions. This method avoids the use of volatile precursors and release of harmful organic compounds. Commonly used precursors are titanium alkoxides or titanium chloride. But

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Breaking the Diffraction Limit Manifold Using Specially Designed Metamaterial Split Ring Resonator

Cherala Bindu[1, 2], Sikha K. Simon[1, 3], Anju Sebastian[1], Panattil V. Aswathi[1], Dona Joseph[1], Jolly Andrews[1], and Vallikkavumkal P. Joseph[1, *]

Abstract—A novel and efficient method to overcome the barriers of conventional diffraction limit using a specially designed metamaterial Split Ring Resonator (SRR) structure as an imaging sensor at microwave frequency is proposed. The topology of the proposed sensor is ingeniously designed to identify imaging objects having dimensions much less than the interacting wavelength λ. The split gap field region of the conventional SRR, used as the sensing region of the imaging sensor, is modified for enhancing the resolution capacity, by slightly raising the split region of the outer ring structure perpendicular to the plane of the resonator (Projected Split Ring Resonator — PSRR) which will reduce the area of the sensing region of the SRR probe considerably. The isolation of the structural parts of the SRR other than projected split region helps in using the localized evanescent field at the split region of the PSRR for imaging of minute objects having dimension ranges up to 0.0001λ by precisely choosing the split gap. The required projection height of the split region and the possible resolution limits of the PSRR sensor probe are evaluated by simulation. Experimental 2-dimensional sub-wavelength images obtained for various dielectric objects using a typical PSRR test probe having resolution capability up to 0.01λ are also presented.

1. INTRODUCTION

Microwave based imaging techniques have been used for various sensor applications due to their non-destructive and non-invasive nature. Different types of metamaterial structural units and surfaces have been widely proposed recently for various modes of sensors [1–6]. Near field microwave probes can confine evanescent fields to regions having dimensions much smaller than operating wavelength, and hence they are able to resolve sub-wavelength features and thereby provide a resolution much higher than the classical Abbe limit [7, 8]. Earlier microwave near-field techniques mainly focused on a topology of microstrip line resonator terminated with a sharpened tip or a small loop and were reported to achieve a better resolution in dielectrics [9–11]. With sophisticated experimental setup, they were able to map material non-uniformities by carefully designed conductivity mapping technique [12]. Later, the possibility of making a perfect lens using metamaterial structures and thereby achieving a resolution higher than classical diffraction limit was theoretically proposed in the pioneering work of Pendry [13]. In that work, the concept of a negative refractive index material capable of completely restoring both propagating and evanescent waves in phase and amplitude resulting in the recovery of sub-wavelength features leading to a perfect imaging of the sample was presented. Microwave near-field probe made of single rectangular Split Ring Resonator (SRR), and an electrically small rectangular loop was designed by Ren et al. which provided a resolution of $\lambda/74$ based on sub-surface detection technique [8]. For the purpose of obtaining super resolution imaging using metamaterial structures, specially designed

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The millipede genus *Klimakodesmus* Carl, 1932, with the description of a new species from Kerala state, southern India (Diplopoda, Polydesmida, Pyrgodesmidae)

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Abstract

Klimakodesmus Carl, 1932 is briefly redescribed, rediagnosed, and shown to be an oligotypic genus endemic to southern India and distinct from the particularly similar genus *Pyrgodesmus* Pocock, 1892, monobasic and endemic to Sri Lanka, by several important features of peripheral and, especially, gonopodal structure. A new species, *Klimakodesmus bilobocaudatus* **sp. nov.**, is described from Kerala state, India, differing from the sole accepted, and type species *K. gravelyi* Carl, 1932, from Tamil Nadu state, primarily by the laterally trilobate paraterga, the caudally more deeply bilobate mid-dorsal keel on ring 19, and certain minor details of the gonopodal structure.

Key words: *Klimakodesmus*, *Pyrgodesmus*, taxonomy, new species, India, Sri Lanka

Introduction

At present, the millipede fauna of India, however insufficiently studied, comprises 270+ nominate species or subspecies in at least 90 genera, 25 families and 11 orders (Golovatch & Wesener 2016). Of them, the large and mostly tropical family Pyrgodesmidae contains some 14 species in seven genera, including *Klimakodesmus* Carl, 1932.

The taxonomy of Pyrgodesmidae is long known to be particularly badly confused and chaotic globally, with more than 170 genera, largely monotypic, and nearly 400 species all over the tropics, marginally in Southern Europe, North Africa, southern U.S.A., Japan, Taiwan and central China (Enghoff *et al.* 2015). Progress is strongly hampered by the small size of the animals (typically 3–16 mm long), as well as the outstandingly diverse and often complex structures, both peripheral and gonopodal, which are often difficult to see, let alone describe and depict. Numerous pyrgodesmid genera remain monotypic, often based only on female or even juvenile material, and delimited using solely such somatic features as the number of body segments/rings, the shape, distribution and location of ozopores and tergal ornamentations, the structure of the paraterga etc.

Klimakodesmus was originally described based on a single, and type species, *K. gravelyi* Carl, 1932, originating from near Coonoor and Mudumalai, both in Tamil Nadu state, Western Ghats, southern India (Carl 1932). Verhoeff (1939) promoted *Klimakodesmus* to the rank of a monobasic subfamily, Klimakodesminae Verhoeff, 1939, but presently it is considered as a strict junior subjective synonym of Pyrgodesmidae (Hoffman 1980; https://www.fieldmuseum.org/sites/default/files/taxon_table_5.pdf).

Carl (1932), when erecting his *Klimakodesmus*, compared it to *Pyrgodesmus* Pocock, 1892, the type genus of Pyrgodesmidae and also monobasic (Pocock 1892), because both genera shared numerous somatic features. He paid special attention to the identity of *Pyrgodesmus obscurus* Pocock, 1892, the type species of *Pyrgodesmus*, described from two male syntypes from Pundaluoya, Sri Lanka. Carl (1932) compared the original, rather superficial description and few schematic drawings of *P. obscurus* as given by Pocock (1892) to the excellent and richly illustrated

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γ-MnOOH-graphene nanocomposite as promising anode material for Li-ion capacitors

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ABSTRACT

Developing environmentally benign electrode materials with faster Li-ion kinetics is an essential requirement for high-performance Li-based energy storage devices. Here we report the large-scale synthesis of γ-MnOOH-graphene (γ-MnOOH-rGO) nanocomposite, through a simple hydrothermal route, for their application as potential anode material in Li-ion batteries. As-synthesized nanocomposite with the γ-MnOOH nanorods uniformly anchored on the graphene sheets exhibits enhanced electrochemical performance and achieves a very high specific capacity of ~435 mAh g^{-1} at a current density of 1.0 A g^{-1}. Detailed electrochemical studies reveal faster Li-ion kinetics in γ-MnOOH-rGO nanocomposite electrode, dominated by non-diffusion controlled processes (~ 80% at 1.0 mV s^{-1}). Further, the full-cell Li-ion capacitor fabricated with γ-MnOOH-rGO nanocomposite as the anode and activated carbon as the cathode exhibits a maximum energy density of ~51 Wh kg^{-1} and a maximum power density of ~ 6.3 kW kg^{-1}, with excellent capacity retention of more than ~87% upon 8500 cycles. The present work thus demonstrates γ-MnOOH-graphene nanocomposite as promising anode material for advanced Li-ion batteries and high power Li-ion capacitors.

1. Introduction

Electrochemical energy storage systems such as batteries and supercapacitors are considered as most promising technologies that provide sustainable solutions to address the rising energy demands and environmental concerns [1]. Lithium-ion batteries (LIBs), prevalent in the electronic markets for the last three decades, continue to be the dominant power source for a wide range of applications, from portable electronic devices to large-scale hybrid electric vehicles and grid storage [2]. However, many research activities are focused on exploring alternative materials to replace the conventional graphite anode that is fundamentally limited by low specific capacity (~ 372 mAh g^{-1}), poor rate capability, and safety concerns [3,4]. In search of various anode materials for LIBs, manganese-based transition metal oxides attain much importance due to their low cost, high abundance, enhanced activity, multiple oxidation states, various possible crystal structures, and the environmentally benign nature [5–8]. Among the different manganese-based transition metal oxides, the tunnel structured γ-MnOOH shows promising potential as anode material for lithium-ion batteries owing to its high theoretical capacity of 914 mAh g^{-1} (three times greater than graphite) and better electronic conductivity ~10^{-4} - 10^{-5} S cm^{-1} in comparison with MnO_x (~10^{-8} to 10^{-6} S cm^{-1}) [9,10]. However, like other manganese oxides, γ-MnOOH experience capacity fading upon cycling arising from severe volume changes resulting in low initial Coulombic efficiency and poor cycling stability [11–14]. Engineering of materials in the nano regime helps overcome these issues through the improved active surface area and reduced ion diffusion length, thus resulting in enhanced electrochemical performances. Hybridizing the materials with carbon matrices (such as graphene, carbon nanotubes, carbon nanofiber) further improves the electronic and ionic conductivities, thus suppressing the volume changes, resulting in long-term stability as well as high rate capability of the hybrid electrode [15–18].

Herein we employ γ-MnOOH-rGO nanocomposite, synthesized by a

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The millipede genus *Klimakodesmus* Carl, 1932, with the description of a new species from Kerala state, southern India (Diplopoda, Polydesmida, Pyrgodesmidae)

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Abstract

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Diversity of bee (Insecta: Hymenoptera: Apoidea) pollinators of Ash gourd [*Benincasa hispida* (Thunb.) Cogn.] in Malappuram district, Kerala

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Abstract
Eleven species of bees under 8 genera were collected from flowers of ash gourd [*Benincasa hispida* (Thunb.) Cogn.] from Malappuram district of Kerala, India. Out of the 8 genera present, 7 belong to family Apidae and the highest number of individuals belong to genus *Tetragonula* Moure. Diversity of bee pollinators of ash gourd in the study area is in a good state.

Keywords: ash gourd, bee pollinators, diversity

Introduction
Ash gourd [*Benincasa hispida* (Thunb.) Cogn.] is a vegetable from the family Cucurbitaceae which have many medicinal properties as well as economic values [1]. This vegetable is grown in tropical and subtropical regions and it contains water, carbohydrate, minerals and vitamins [2]. It has a long storage life and also known by the names wax gourd, white gourd, winter melon, white pumpkin and so on [3]. Ash gourd is monoecious and hence it depends on insects for pollination [4]. Bees which belong to the order Hymenoptera of class Insecta are the important group of insect pollinators. They are efficient pollinators of many crops including Cucurbits [5]. To increase crop yield and to ensure propagation of plants, optimum pollination is required [6]. Many studies have been conducted so far regarding the insect pollinators of cucurbits and their effects in pollination and fruit setting. These studies revealed the importance of insect pollinators in these cross-pollinated crops [7, 8, 9]. The flowers of ash gourd attract many insect pollinators. Hence conservation and management of these pollinators are very crucial. Here we conducted a short-term study to know exclusively about the bee pollinators of ash gourd and their diversity in Malappuram district of Kerala.

Materials and methods
Study area
Study was conducted in Pattarakka (11.267555°N, 76.247175°E), a place in Malappuram district of Kerala, India in the months of October and November 2019 and 2020.

Collection of bees
Bees were collected in between 08.00 am and 03.00 pm, in the 5×5m transect. Observations were made once in each month of study. Bees were collected using sweep nets (10 sweeps/5m). Collected specimens were killed using ethyl acetate and stored in 70% alcohol. Later the specimens were pinned and dried. Identification up to morpho species level was done using published keys.

Statistical analysis
Diversity indices were calculated using PAST (Paleontological Statistics Software Package) software version 4.03 [10]. Relative abundance of the species was also determined using the formula,

$$\text{Relative abundance of species A} = \frac{\text{Number of individuals of species A}}{\text{Total number individuals collected}} \times 100$$

Results and Discussion
A total of 142 specimens were collected during the study. The collected specimens belong to eleven species under 8 genera. Out of the 8 genera present, 7 belong to family Apidae and only one genus belongs to family Halictidae (genus *Halictus* Latreille). Table 1 provides the month wise data of bees collected from the study area. Highest number of individuals collected from ash gourd flowers belong to genus *Tetragonula* Moure (35 individuals).
Diversity indices were calculated for species level. The number of species was higher in the month of November 2019 (9 species) and lower in other months (8 species). Total number of individuals collected was also higher in November 2019 (37 individuals) and lower in the month of October 2020 (33 individuals). The Shannon-Wiener index and Simpson's index were also higher in the month of November 2019 (1.997 and 0.8459 respectively) and lower in the month of November 2020 (1.916 and 0.8318 respectively). Evenness was higher in October 2019 and lower in November 2019 (0.8927 and 0.8185 respectively). The diversity indices used in this study are given in table 2. Even though the diversity indices show only slight differences across the study period, it indicates that diversity of bee pollinators of ash gourd is in good state in the study area.
Relative abundance of bees collected from ash gourd were determined (Table 3). *Tetragonula* sp. has the highest relative abundance (24.64 per cent) followed by *Apis cerana* Fabricius (17.60 per cent). A study conducted on the relative abundance and foraging activity of hymenopteran pollinators in cucurbits of Kerala revealed *Tetragonula travancorica* Shanas and Faseeh as the dominant pollinator in ash gourd with relative abundance of 33.50 per cent and *Apis cerana indica* Fabricius with second largest relative abundance of 27.41 per cent [7]. Another study examined the role of insect pollination on fruit production of ash gourd revealed *Tetragonula iridipennis* (Smith) as the most

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Diversity of short-horned grasshoppers (Orthoptera: Caelifera) in selected mangrove ecosystem and Kole Wetland of central Kerala, India

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Abstract
The Caeliferan diversity in selected Kole wetland and mangrove ecosystem of Thrissur was documented for seven months from June to December 2018. A total of 11 species belonging to seven subfamilies and two families were recorded. Species richness was higher in the Kole wetland, but they were more evenly distributed in the mangrove ecosystem. The study was interrupted by the 2018 Kerala flood, and the grasshopper distribution in relation to the flood was recorded.

Keywords: orthoptera, caelifera, grasshopper, Kole Wetland, mangrove, diversity

Introduction

Orthopterans are the primary insect group representing grassland ecosystems, [1] comprising grasshoppers, crickets and katydids. The suborder Caelifera of order Orthoptera represents grasshoppers with lesser antennal segments (short-horned grasshoppers). About 29,009 grasshoppers are known so far from the world, [2] among which only 1033 species are recorded from India,[3] 140 species from Kerala [4, 5, 6, 7, 8]. The pest status of grasshoppers in India is one reason for the lack of information on their functional role in different ecosystems [5]. Being important primary consumers and contributing to the diet of many other animals, grasshoppers play a significant role in the functioning of grassland ecosystems [9, 10]. They are good indicators of the health and quality of different habitats and respond quickly to the changing environmental conditions [11]. But they remain less explored and no grasshopper species in India has so far been considered as a biodiversity indicator [4]. Prabakar and Radhakrishnan [12] documented four new reports of grasshoppers from Kerala while studying the orthopteran specimens of the Zoological Survey of India collection. Koya *et al.* [13] recorded 35 species belonging to five families from Palakkad, Kerala. Bhaskar *et al.* [4] compiled a checklist for Orthoptera of Kerala in which they reported 130 species of Orthoptera. Bhaskar *et al.* [5] studied the impact of fire management practices on the grasshopper fauna of Eravikulam National Park and Parambikulam Tiger Reserve, Kerala. Bhaskar *et al.* [14] rediscovered *Mopla guttata* Henry, from Western Ghats, Kerala, and described the first male specimen of the genus. Bhaskar *et al.* [6] recorded a new species *Tettilobus trishula*, from the Western Ghats of Kerala. The grasshopper diversity of the Kole wetlands and mangrove ecosystems of central Kerala was never documented. The present study aims to find the grasshopper diversity in two selected wetland ecosystems; mangrove and Kole wetland of the Thrissur district of Kerala state. The Kole wetlands are one of the largest, highly productive and threatened low lying wetlands located 0.5 - 1m bmsl. The Kole wetland, including paddy field greenery spread over the Thrissur and Malappuram districts of Kerala, recognized as one of the Ramsar sites during 2002 [15]. The 'Kole' is a local term in regional language (Malayalam) that refers to the bumper yield or high yield, which is a particular cropping pattern from December to May [16]. Mangroves, globally distributed on tropical shores, consist of trees, shrubs, climbers, and ferns adapted to saline and anoxic habitats which make mangrove plants structurally and functionally unique [17, 18, 19]. In Kerala, the maximum extent of mangroves is reported from Kannur (1100 ha), followed by Ernakulam (600 ha) and Kasaragod (315 ha). Thrissur has a minimum extent of 30 ha. of mangroves [20]. Human intervention is evident in both the Kole wetland and Mangrove ecosystem as paddy and aquaculture practices respectively. Since the impact of human intervention can significantly affect these ecosystems' faunal diversity, field surveys and faunal documentation programmes are needed to know the status and distribution of species to implement conservation efforts. No work has been reported so far on grasshopper diversity from these ecosystems of this region; hence this primary step on inventorying the grasshopper fauna of these ecosystems will form a foundation for carrying out future research in this area.

Materials and Methods

Two kinds of wetland ecosystems; Mangrove ecosystem in Vallivattaom (10°15'51.79'' N and 76°11'31.18'' E) and the Kole wetland of Muriyadu (10°21'51.46" N and 76°15'53.54" E) in Thrissur district, Kerala, India, were selected for monitoring grasshopper diversity. The study was conducted from June to December 2018.

A systematic collection of grasshoppers was done from both fields twice a month. The collection was done by net sweeping, covering a linear distance of 10m on a band of about 1m width [21]. Being cold-blooded organisms, grasshoppers place themselves on the vegetation surface to warm up during morning hours at low-intensity sunlight.[22] Hence, the collection was carried out during the morning hours from 9:00 am to 11:00 am. The collected specimens were killed by using ethyl acetate, spread, dried and preserved by pinning. Voucher specimens were preserved and deposited in Shadpada Entomology Research Lab

First Record of Croce filipennis Westwood, 1841 (Neuroptera: Nemopteridae) from Kerala

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First Record of *Croce filipennis* Westwood, 1841 (Neuroptera: Nemopteridae) from Kerala

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Abstract

The family Nemopteridae with the species *Croce filipennis* Westwood is recorded for the first time from Kerala. Description of the species with the images and the distribution in India is mapped.

Keywords: *Croce*, Nemopteridae, Kerala

Introduction

Neuroptera is one of the major group of holometabolous insects, which includes various structurally and biologically heterogeneous members. They feed on soft-bodied insects, including agricultural pests in their larval and adult stages, thus offer their use in biological control measures. There are 5,813 species of Neuroptera recorded worldwide among which 312 species belonging to 112 genera and 12 families are known from India which forms about 5% of the world occurrence (Oswald & Machado, 2018; Chandra & Sharma, 2009).

Nemopteridae is a bewitching family of Neuroptera which comprises two extant subfamilies, Crocinae (thread-wings) and Nemopterinae (spoon and ribbon-wings). The family is distinguished by their elongated ribbon or thread-like hindwings and specialised mouthparts with a long rostrum for pollen and nectar collection (Tjeder, 1967; Picker, 1987; Mansell, 1996). There are 146 species under 36 genera of Nemopteridae reported worldwide, which includes 48 species of Crocinae and 98 species of Nemopterinae (Oswald & Machado, 2018). In India, only four species belonging to three genera of Nemopteridae are reported (Oswald, 2020). Even though adult Nemopterids are obligate nectar and pollen feeders with specially adapted elongate mouthparts, the larvae of Nemopteridae are specialised predators, with elongated mandibles and maxillary laciniae adapted for piercing and ingesting the internal tissues of small arthropods (Popov, 1963, 1973).

The subfamily Crocinae is marked by its thread-like hindwings that function as tactile sensors and mate recognition systems (Mansell, 1996; Monserrat, 1996). The larvae of Crocinae have specialised habitat preferences including small caves, under-rock overhangs or hollow tree trunks, while the adults are mainly nocturnal and crepuscular (Sole *et al.*, 2013). *Croce* McLachlan, 1885 come under this subfamily with *Croce filipennis* Westwood, 1841 as the only species reported from India.

According to the literature, this species is not reported from any other country. This graceful insect flies with a weak peculiar up and down motion with the long hindwings streaming in the air. The larvae are found among the dust and refuse on floors, feeding on small insects like psocids. The life history is completed in a year (Imms, 1911). Incidentally, scanning of the literature revealed the absence of Nemopteridae from Kerala. Thus, this report of *Croce filipennis* forms the first record of Nemopteridae in the state.

Material and Methods

Insects were collected using sweep-net and light trap. The collected specimens were killed by using a killing jar with 2 to 3 drops of Ethyl acetate. Later, specimens were dried, card mounted and held on entomological pins with proper labelling. The specimens were examined under Leica M205 Stereomicroscope. The terminology of wing venation and identification followed Navás (1910) and Tjeder (1967). Measurements were taken in millimetres.

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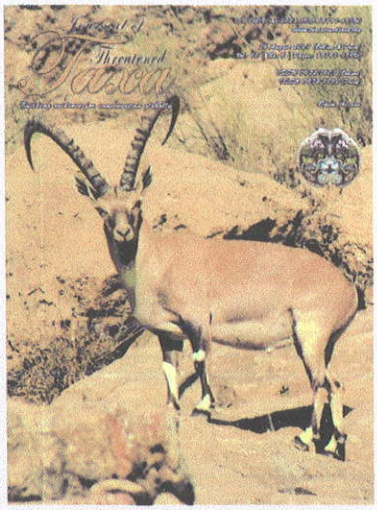

NOTE

FIRST RECORD OF *MANTISPILLA INDICA* (WESTWOOD, 1852) (NEUROPTERA: MANTISPIDAE) FROM THE WESTERN GHATS, INDIA

T.B. Suryanarayanan & C. Bijoy

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NOTE

First record of *Mantispilla indica* (Westwood, 1852) (Neuroptera: Mantispidae) from the Western Ghats, India

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Order Neuroptera is a heterogeneous group of holometabolous insects with varying structure and biology. There are around 6,000 species of Neuroptera reported worldwide, but from India, only 327 species of Neuroptera under 115 genera and 12 families are reported (Singh et al. 2020; Oswald 2020).

Mantispidae is a family of Neuroptera which resembles the praying mantids (Order Mantodea), because of their raptorial forelegs that are inserted at the apical end of the elongated prothorax, so they are frequently called mantid-flies (Ohl 2007). Mantispidae is represented by four extant subfamilies and 410 species worldwide, of which only 17 species under seven genera representing a single subfamily, Mantispinae are known so far from India (Chandra & Sharma 2009; Ohl 2007). Among these, only five species (*Euclimacia nodosa* (Westwood, 1847) from Kerala, *Mantispa coorgensis* Ohl, 2004 from Coorg, Karnataka, *Mantispa cora* Newman, 1838 from Malabar, Kerala, *Mantispa maindroni* Navas, 1909 from Tamil Nadu, *Mantispilla salana* (Navas, 1931) from Maharashtra (Ghosh & Sen 1977; Bhattacharjee et al. 2010; Singh et al. 2020) were reported from Western Ghats as per the available literatures. Apart from this, Bijoy & Rajmohana (2012) reported an unidentified species of *Tuberonotha* Handschin, 1961 from Western Ghats (Wayanad, Kerala). Most of the larvae of Mantispinae are parasites of Hymenoptera and spiders and have a complicated development called hypermetamorphosis (Ghosh 2000b).

The subfamily Mantispinae in India comprises *Mantispilla* Enderlein, 1910 as the predominant genera with three species (Snyman et al. 2018). *Mantispilla* was synonymised under *Mantispa* Illiger in Kugelann, 1798 by Penny (1982), but Snyman et al. (2018) recognised *Mantispilla* as a valid genus. In this study, we report *Mantispilla indica* (Westwood, 1852) for the first time from the Western Ghats as well as from Kerala.

Specimens were collected using the light trap. The collected specimens were killed by using a killing jar with 2–3 drops of ethyl acetate. Later, the specimens were dried; Changes to, mounted and held on entomological pins with proper labelling. They were examined under Leica M205 stereomicroscope. The terminology of wing venation and identification followed Ghosh (2000b) and Snyman et al. (2018). The digital imaging of specimens was taken with Nikon Coolpix P900 with Raynox 250 lens. Distribution map of the species in India was plotted using QGIS 3.12.3 software. Specimens were deposited in the

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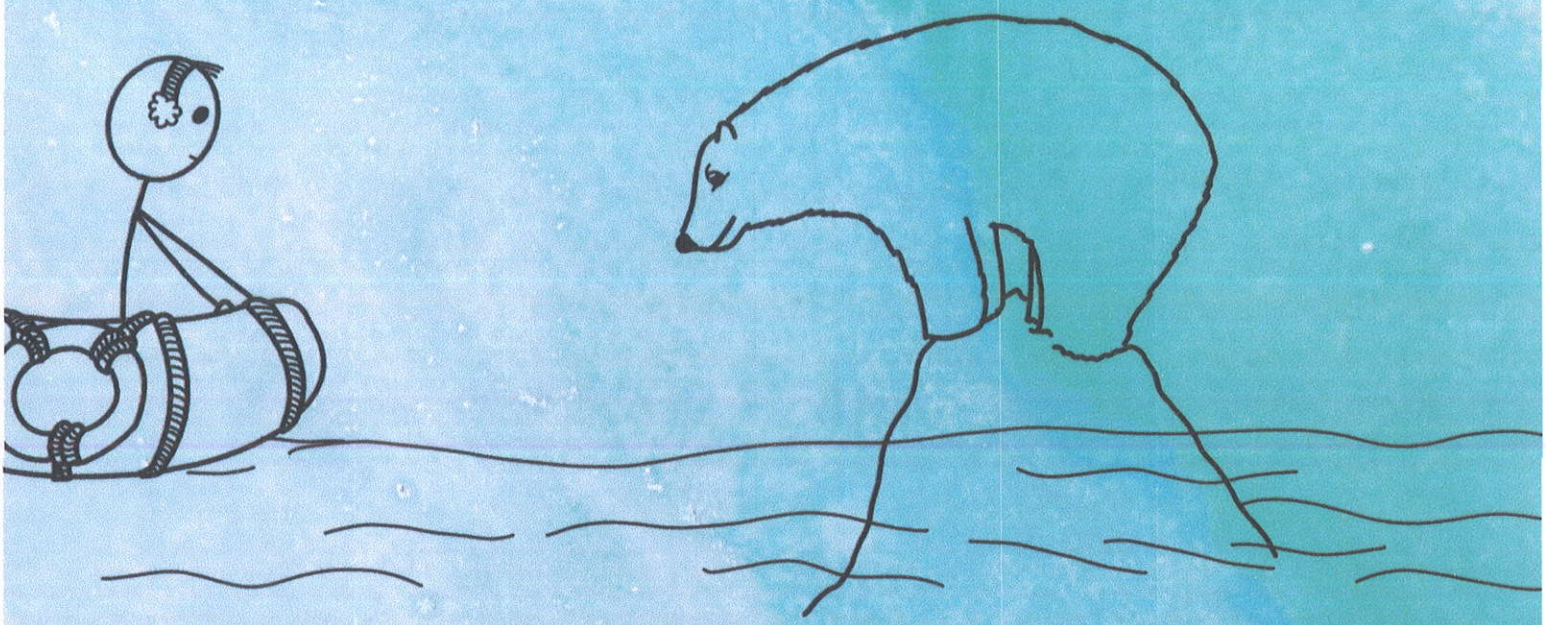

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FIRST RECORD OF THE FAMILY LIOPTERIDAE (HYMENOPTERA: CYNIPOIDEA) FROM INDIA

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2) *SERL, Christ College (Autonomous), Irinjalakkuda, Thrissur, Kerala-680125, India.*

Summary. Family Liopteridae (Hymenoptera: Cynipoidea), an archaic group of parasitoid wasp, is reported from India for the first time. *Paramblynotus annulicornis* Cameron, 1908 is found in the Great Nicobar Island. The specimen from India is re-described and illustrated.

Key words: parasitoid wasps, Liopteridae, fauna, new record, Great Nicobar Island, Oriental region.

К. Раджмохана, С. Биджой, С. Патра. Первое указание семейства Liopteridae (Hymenoptera: Cynipoidea) из Индии // Дальневосточный энтомолог. 2021. N 433. С. 13-17.

Резюме. Впервые для Индии приводится семейство Liopteridae – архаичная группа паразитических перепончатокрылых (Hymenoptera: Cynipoidea). На острове Большой Никобар найден *Paramblynotus annulicornis* Cameron, 1910. Приводится иллюстрированное описание экземпляра из Индии.

INTRODUCTION

Family Liopteridae is an archaic group of parasitic wasps (Buffington *et al.*, 2020). Together with Austrocynipidae and Ibaliidae, they form the paraphyletic basal lineage of Cynipoidea (Ronquist, 1995a). Liopteridae is widespread in all zoogeographical regions, but most diverse in the tropics and subtropics (Liu *et al.*, 2007). There are about 200 species in four subfamilies: Liopterinae, Oberthuerellinae, Dallatorrellinae, and Mayrellinae (Dong *et al.*, 2018; van Noort, 2020). As a result of the studies on the diversity of parasitoid wasps of the Great Nicobar Island, a single specimen of the family Liopteridae was caught by authors and is hereby reported from India for the first time. This specimen is described and illustrated in the present paper.

MATERIAL AND METHODS

The specimen studied was collected in one of the yellow pan traps set in the forest at Campbell Bay, Great Nicobar Island. The specimen is dry and card mounted for taxonomic

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Short Communication No. ent. 46308

Macrohymenopteran diversity in Thommana Kole wetland, Thrissur, India

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ABSTRACT: The study conducted on the diversity of macrohymenoptera at the Thommana Kole wetland, Thrissur, Kerala revealed 36 species from 24 genera and 9 families.

KEYWORDS: Abundance, Hymenoptera, wetlands.

Wetlands supports rich biodiversity by providing many unique habitats for organisms and hence known as biological supermarkets (Mitsch and Gosselink, 2000). Wetlands in Kerala are very important ecosystems. In 2002, Kole wetlands were declared as Ramsar sites which increased the importance (Jayson, 2018). Kole wetlands are the water-logged, paddy cultivating areas and cover an area of 13,632 ha and spread over the Thrissur and Malappuram districts of Kerala (Johnkutty and Venugopal, 1993).

A study was conducted from October to December 2019 to analyze the relative abundance of macrohymenopteran insects at the Thommana Kole wetland of Thrissur, Kerala. The term macrohymenoptera is followed in this work, which normally includes larger species and with numerous veins in their forewing (Mason and Huber, 1993). Thommana (10^0.3463 N 76^0.2541 E) is a village in Irinjalakuda block in the Thrissur district of Kerala state, India. It is a highly diverse and productive ecosystem. The study site is a part of Muriyad Kole, which is a freshwater wetland (Thomas *et al.*, 2003). Line transect method was used to survey the study site. The macrohymenopterans were collected by using a sweep net and by handpicking. Periodic collection of macrohymenopterans was done twice a month, taken in the morning from 8:00 am to 11:00 am. Ethyl acetate was used for killing the collected specimens. The killed specimens were dried and preserved for further study. Liquid preservation is used for the temporary storage of ant specimens until the specimens were card mounted for species identification. 70% ethanol is used as preservation fluid. The specimens were kept in small vials filled with alcohol, labelled and checked periodically. The specimen as such and its photographs were taken for identification. Identification was done up to the maximum possible level with the help of hymenopteran experts.

Altogether 36 species belonging to 24 genera and 9 families of macrohymenoptera were recorded during the period of study. Fig. 1 represent number of individuals collected from each genus. Families include Halictidae, Apidae and Megachilidae of bees; Vespidae, Scoliidae, Ichneumonidae, Mutillidae and Sphecidae of wasps and Formicidae of ants. Specimens were identified to

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Record of *Apochrysa evanida* Gerstaecker, 1893 (Neuroptera: Chrysopidae) from the Western Ghats, India

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ABSTRACT: *Apochrysa evanida* Gerstaecker, 1893 belonging to the Chrysopidae family of Neuroptera is reported for the first time from the Western Ghats and Kerala state. The species is described with its distribution.

KEYWORDS: Report, *Apochrysa evanida*, Kerala, distribution

The order Neuroptera includes 5,813 species worldwide (Oswald and Machado, 2018; Oswald, 2021) and 327 species reported from India, under 115 genera and 12 families (Singh *et al.*, 2020). Chrysopidae (geen lacewings) is the second-largest family of Neuroptera with over 1,200 species belonging to 80 genera (Brooks and Barnard, 1990) from the world, of which 70 species under 22 genera have been reported from India (Singh *et al.*, 2020). Chrysopidae comprises three extant subfamilies: Nothochrysinae, Chrysopinae and Apochrysinae. Apochrysinae (delicate lacewings) is the smallest subfamily, globally comprises 26 species under six genera. Only three species under two genera are known from India (*Joguina nicobarica* (Brauer, 1864) from Assam, *Joguina unimaculata* Winterton, Balakrishnan and Chenthamarakshan, 2021 from Kerala and *Apochrysa evanida* Gerstaecker, 1893 from Karnataka) (Ghosh, 2000; Winterton and Brooks, 2002; Chandra and Sharma, 2009; Winterton and Gupta, 2020; Winterton *et al.*, 2021). *Apochrysa* Schneider is the predominant genera of Apochrysinae with 10 species reported worldwide (Winterton and Gupta, 2020). Species under this genus are distributed throughout the world, including Afrotropical, Palaearctic, Oriental and Oceanian realms. *A. evanida* (vanishing delicate lacewing) is the only species reported under *Apochrysa* from India, but it is not reported so far from the Western Ghats region (Ankita Gupta, Pers. comm.) (Winterton and Gupta, 2020). *A. evanida* was collected from the Western Ghats as well as from Kerala and details presented.

Specimens were collected using a sweep net from Valliyoorkavu, Wayanad. The surrounding habitat is semi-closed forest with large trees and thick vegetation. Later the collected specimens were killed with 2 to 3 drops of ethyl acetate using a killing jar. After this, specimens were dried and held on entomological pins with proper labelling. The specimens were examined under Labomed Luxeo 6Z Stereomicroscope. The terminology of wing venation and identification followed Breitkreuz *et*

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ORIGINAL PAPER

High performance polyvinyl alcohol/calcium titanate nanocomposite anion-exchange membranes as separators in redox flow batteries

P. P. Moly[1] · C. B. Jeena[1] · P. J. Elsa[1] · K. J. Ambily[1] · V. T. Joy[1]

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Abstract Low ionic conductivity and poor chemical stability are the two key parameters that limit the use of many anion-exchange membranes in electrochemical applications like rechargeable batteries and fuel cells. Herein we report a method for the synthesis of a high performance anion-exchange membrane fabricated by incorporating calcium titanate nanoparticles ($CaTiO_3$) into polyvinyl alcohol (PVA) matrix. The $CaTiO_3$ was synthesized by a new co-precipitation method from a solution of two simple precursors, viz potassium titanyl oxalate and calcium chloride. The XRD data of the synthesized nanoparticles indicate a phase pure orthorhombic perovskite structure. Morphological features investigated with SEM and TEM studies, reveal that the $CaTiO_3$ is having spherical shape with a diameter of approximately 200 nm. The PVA/$CaTiO_3$ nanocomposite membranes were fabricated by solution casting method from a well dispersed suspension of $CaTiO_3$ in PVA and characterized by FT-IR spectroscopy, TGA, SEM, AC impedance analysis and tensile strength measurements. The membranes with 30 wt% $CaTiO_3$ content possess ionic conductivity of 66 mS cm^{-1} at room temperature. The electrochemical performance of an all-iron redox flow cell was studied using galvanostatic charge–discharge tests using the above nanocomposite membrane as separator and the system exhibited a coulombic efficiency of 75% during the charge–discharge cycles.

Keywords Calcium titanate · Anion-exchange material · PVA/$CaTiO_3$ nanocomposite · Anion-exchange membranes · All-iron redox flow battery

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