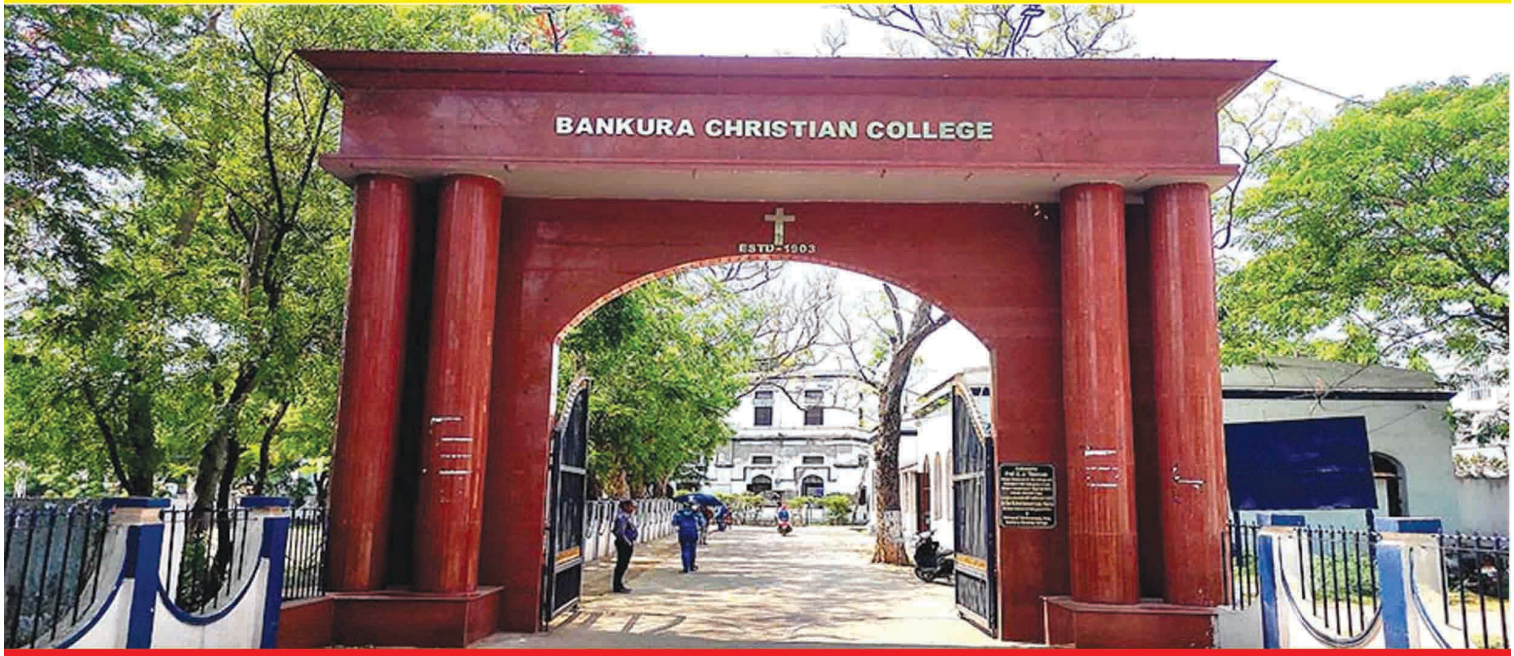
ECO FOCUS

News Letter

Bankura Christian College

Volume - 10 Issue - 1 2022 - 23



CONTENT

EDITORIAL

Environmental awareness programme, continuing for a long, aims to ameliorate the environmental problems. Various magazines and other media are continuing their efforts to save the precious environment, to save ourselves and our future generations. Perhaps all the environmental problems originate from the problems of human population exploitation, attitude of our species Homo sapiens sapiens towards environment and unsustainable development. Rapid, unscientific and commercial exploitation of natural resources cause irreparable damage of the environment. Deterioration of the environment affects the poor more seriously. Environmental problems like drinking water crisis, biodiversity loss and global warming and emerging infectious diseases are continuously threatening our survival.

In fact information, education and communication materials are known to have a role in environmental protection. Out of our several initiatives so far taken for promoting eco-friendly practices in our century old college, the publication of newsletter "Eco-Focus" aims to disseminate information among the students to motivate them for working for environment protection. Eco-Focus is published with the initiative of the eco-club of the college.

We trust that involvement of students in environment protection activities like plantation, campus cleaning, sustainable consumption of water, oil and electricity and promotion of eco-friendly practices are some of our small initiatives for environment protection. We have already installed a solar panel for promoting, the use of alternative energy sources.

Lastly, I would like to quote few lines of Peter H Khan, Jr. PhD "What if there was a pill that could reduce depression, anxiety, stress, obesity, diabetes and ADHD symptoms, as well as improve mental health and life satisfaction, eye-sight, birth outcomes, pain control, sleep and social connectedness/ what if that pill had virtually no side effects and was comparatively inexpensive? We have something like that now. Though it's not a pill. It's called nature"

Fatik Baran Mandal

Chief Editor

Is it a bird or an insect ??

Chitra Pramanik,
5th Semester Department of Zoology (H)

This year (2022), in mid-September, one day, when I was walking through a muddy path in my village, a little bird hovering around the tiny flowers of a roadside Lantana sp tree caught my attention. It was so eye-warming to observe this, so I stopped there and started to observe the bird. After a while, I realised that the bird was a little bit smaller than the usual small birds adapted to collect flower nectar. The wings of that creature were beating so fast, and after observing it keenly, a thought came to mind," somehow, is it an insect?!"

I was immensely curious to know more about that creature, so I tried to collect information about it and came to the conclusion that though it looks like a bird, but it is not a bird. It is an insect called Hummingbird Hawk Moth.

So here in this article, I have tried to enlighten the life history and different features of this beautiful creature of mother nature in detail.

Moths under the family Sphingidae are called Hawk moths. Worldwide, it is estimated that there are about 1,600 species and 210 genera of hawkmoths (Kitching 2020). Most of the members of the Sphingidae family are nocturnal, and very few have diurnal and crepuscular habits. Hawk moths are one of the foremost nocturnal pollinators of neotropical regions (e.g. South America, Central America, the Caribbean islands, and southern North America.)

Generally, Macroglossum stellatarum is known as Hummingbird Hawk Moth due to its close morphological resemblance to hummingbirds. These moths have greyish-brown forewings with black lines and orangish-yellow hindwings with dark borders. Their wing span is 4 - 5.8 cm. The abdomen is rather broad, terminated by a short fan-shaped tail formed from the scales of the caudal tuft, which looks like a hummingbird. Their broad body indicates that they are efficient fliers. They are diurnal in nature. They have a long proboscis that helps them to collect nectar from tube-shaped flowers. M. stellatarum possesses a proboscis 25–28 mm in length, which enables it to exploit several flower species whose nectar is not available to other anthophilous insects, which helps them to avoid competition for food (Muller, 1881). Just like hummingbirds, they also have precise feeding habits and occupy similar feeding niches. The hawk moths possess excellent eyesight, which is crucial to detect slight movements. Unlike other phytophagous insects, hawk moths are primarily dependent on their vision to find their host plant. This is also very similar to hummingbirds as they also use visionary skills to find host plants as they have poor senses of smell. Efficient vision helps these moths to pursue their hovering behaviour while visiting a plant. Hummingbird hawk moths also emit an audible humming sound while hovering around flowers. They can beat their wings 70-80 per second. Flower-visiting behaviour and flying patterns of hummingbirds and hummingbird hawk moths show close similarities that indicate that adaptations of hummingbird hawkmoths and hummingbirds are an example of convergent evolution.

Systematic position of Hummingbird Hawk Moths :

Phylum - Arthropoda

Class - Insecta

Order - Lepidoptera

Family - Sphingidae

Subfamily - Macroglossinae

Genus - Macroglossum

Species – stellatarum

Figure-1: Macroglossum stellatarum collecting nectar

They are found in North Africa, Southern Europe, and Asia. They are migratory insects and fly efficiently through a long distance. They spend their winters in warmer regions of Asia and North Africa and summers in Northern Europe, Russia and Mongolia.

Except for M. stellatarum, more hawk moths from the subfamily Macroglossinae look like hummingbirds.

The members of the genus Aellopos are also considered hummingbird hawk moths. Aellopos (represented by four species: A. ceculus, A. fadus, A. titan, and A. tantalus) show exclusively diurnal habits. The close resemblance between Aellopos spp. and hummingbirds has caught the attention of naturalists in Brazil since the travels of Henry Bates in the Brazilian Amazon during the 19th century. According to reports, the inhabitants of that area are truly convinced that Aellopos titan and Hummingbirds are the same organisms (Bates 1863). All the members of the Aellopos genus have a white dorsal band in their abdomen. Aellopos sp hawk moths have a distinct morphological resemblance with hummingbirds of the genus Lophornis (Coquette hummingbirds). In Brazil, the distribution of four species of the genus Lophornis overlaps with the distribution of Aellopos sp.

Systematic position of Aellopos sp moths

Class - Insecta

Order - Lepidoptera
Family - Sphingidae
Subfamily- Macroglossinae
Genus - Aellopos

Figure-2: (a) and (b) Lophornis verreauxii (Butterfly Coquette Hummingbird) hovering and collecting nectar from flowers, (c) Aellopos titan (d) Aellopos fadus collecting nectar from flowers possesses morphological resemblance with the hummingbirds (dorsal white band crossing the abdomen)

Another hawk moth under the subfamily Macroglossinae, Hemaris thysbe, is known as the hummingbird clear-wing moth. They have large clear areas in both their fore and hind wings, hence the name. They also have a morphological resemblance to hummingbirds. They are found in mainly major parts of North America, from Alaska to Oregon (West) and Newfoundland to Florida (east).

Systematic position of clearwing hummingbird
Class - Insecta
Order - Lepidoptera
Family - Sphingidae
Subfamily-Macroglossinae

Genus - Hemaris
Species – thysbe

Figure-3: Hemaris thysbe collecting nectar from the flowers

Coming to the conclusion, I would like to say that insects are a major part of our ecosystem. With an extremely diversified life history and evolutionary significance, they are excellent creatures to be observed. Even every element of mother nature possesses its own beauty. In today's technology-based lifestyle, where human beings are struggling to pursue more advanced and smart accommodations, I will still suggest all of you to observe nature; it is full of unique creatures and wonders.

References:

1.Amorim, Felipe W. "Are the New World hummingbird-hawkmoths functional equivalents of hummingbirds?." Ecology 101, no. 12 (2020): 1-4.

2.Carter D. “Butterflies and Moths” (2000).

3.Powell J. A., Opler P. A. “ Moths of Western North America” University of California Press, Ltd. London, England (2009).

4.butterfly-conservation.org

5.https://www.inaturalist.org

6.https://www.pinterest.com/

7.https://youtu.be/JHySy2yspvM?feature=shared

Banana Bio Cell

Ashalata Mahata,
5th Semester, Department of Botany

The high consumption of electricity from year to year and depletion of the availability of fossil energy have triggered an increase in energy prices and scarcity of fossil resources. This problem gives a strong impetus to seek alternative energy sources that are environmentally friendly. One of recent technologies is the Microbial Fuel Cell (MRC) on banana stem, which can convert chemical energy to electrical energy.

Gopal Ji is a youngest scientist of India, by the age of 17,he had done ten inventions, two of which are patented, some of his invention, such as The Banana Bio Cell, has been published around the world in many countries.

It has also been deemed as one of the 3 inventions for environmental protection by Italy.

According to the object of the present invention, a banana plant Cell is provided. The banana plant cell, at least one first electrode and at least one banana plant, at one first electrode and at least one second electrode. Each of the banana plant is a live plant and comprises at least one organic acid as electrolyte. The first electrolyte as an anode is inserted on the banana plant. The second electrode as a cathode is inserted on the banana plant and connected electrically with the first electrode. The banana plant cell according to the present invention has one or more advantages as follows:-

1) The banana plant cell is in accordance with the present invention is constructed on the banana plant which is continuously growing that is the banana plant still has normal physiological metabolism. Therefore, during the cell works, organic salts generated by the anode can be taken away from the electrode with pipelines for transporting water, and hydrogen can be also released via stomata in the plant tissue without the phenomenon of accumulation salts and gas on the electrode surfaces. Therefore, the banana plant cell can work stably over a long period of the time to achieve the functionality of long-term usage.

2) The present invention uses the whole banana plant to replace fruits, the banana plant for generation electrical required organic acid as the electrolyte, not facing problem of for example, limited organic acids as electrolyte within fruits, the short storage life of fruit, and being easy to not and power for a long time.

3) In the era of demanding energy conservation and carbon reduction in the perspective of generative electrical power, it has become a very important innovation how to generate electricity under the premise of not group of absorbing makes use of plant to generate electricity and to reduce the amount of carbon dioxide on earth, plant are the largest group of absorbing carbon dioxide.

4) Due to banana the plant cell using a live plant and capable to supplying electrical power for a long time, it can be applied to a variety of remote areas having a difficulty in power supply, for example proving required electricity to a sensor for detecting landslide, or to a communication base station location in the mountains.

Reference

https://medium.com/@manukamar_57837/gopal-jee-the-youngest-scientists-of-india-fact-check-3fd3f0f3c64b
2) http://dx.doi.org/10.17807/orbital.v14i1.1677
3) Plant Application Publication

The Indian Dead Leaf Butterfly: The Amazing Camouflaged Butterfly

Abhishek Gulimajhi

5th Semester, Department of Zoology

SYSTEMATIC POSITION :

Kingdom:Animalia
Phylum:Arthropoda
Class:Insecta
Order:Lepidoptera
Family:Nymphalidae
Genus:Kallima
Species:Kallima inachus

Kallima inachus, Indian oakleaf or dead leaf or Orange Oakleaf Butterfly is a nymphalid butterfly found in Tropical Asia from India to Japan. With wings closed, it closely resembles a dry leaf with dark veins and is a commonly cited example of camouflage.

The butterfly wings are shaped like a leaf when in the closed position. When the wings are closed, only the cryptic underside markings are visible, which consists of irregular patterns and striations in many shades of biscuit, buff, browns, yellow, and black. The veins are darkened and resemble the veins of a leaf. The resemblance to a dried leaf, is extremely realistic and gives the genus its common names, the oakleaf or dead leaf.

This dead leaf butterfly has a dazzling secret

When it comes to camouflage versus extravagance, this unique little insect doesn't have to choose – it's got the best of both worlds.

When its wings are closed, the species looks exactly like a dried autumn leaf, giving it the cleverest camouflage a butterfly could want. But when its wings are open, it reveals a luminous colour pattern that can hold its own against the world's prettiest wings. The brilliance of the dead leaf butterfly's disguise is the fact that it hasn't just nailed the colouring of a dead leaf, it's got the shape, the midrib, and even the veins figured out, and it all comes together so perfectly. And what's especially cool about it is it even changes its look with the seasons.

The phenomenon called polyphenism describes how distinct characteristics or traits can arise in a single species under different environmental conditions, the dead leaf butterfly has specific dry-season and wet-season forms. Not only do these forms differ in colouration and size, but the wet-season form tends to be smaller than the dry-season form.

While the exact reason for having two distinct forms depending on the season remains somewhat of a mystery, scientists have suggested that the dead leaf butterfly – along with a number of similar tropical butterfly species – has managed to strike the optimal balance between hiding completely, and employing some neat anti-predator strategies.

During the dry season, tropical butterflies tend to be less active. So, as long as they stay perfectly still, camouflage is all they need to hide from predators. In the dead leaf comparison image above, you can see that the dry-season patterning is almost completely uniform. This means the dead leaf butterfly can stay completely hidden, and would-be predators are none the wiser.

But in the wet season, when these butterflies are more active, they display eyespot patterns that are meant to deflect birds, ants, spiders, and wasps from trying to eat them.

Corona Virus Pandemic : Implication on Biodiversity Conservation

Supriti Mondal,
5th semester, Department of Botany

Introduction

Globally the Covid-19 pandemic affected the environment, placing a strain on the economy and all parts of human society. The effects of Covid-19 are inevitable as there is a reduction in human pressure on the natural ecosystem because of the lockdown of social and economic activities. Ecosystem integrity in countries with global hotspots for biodiversity conservation threatened. This paper provides a snapshot of the quickly growing situation caused by the Covid-19 pandemic lockdown and predicts events during normality.

The Covid-19 pandemic is affecting both the physical and social environment. Pandemics are large scale outbreaks of infectious diseases That increase morbidity and mortality over a wide geographic area and cause significant economic, social, environmental disruption. In the Covid-19 case over 2.3 million people dead globally Traveling and integration on the global scale urbanization land use changes, the greater biodiversity exploitation led to the recent increase in pandemics. The Covid-19 positive and negative consequences on biodiversityresources are predictable as the pandemic increases according to human population growth globally. This paper highlighted the positive and negative effects of the Covid-19 pandemic on biodiversity conservation and the implications of temporary short -term and long -term policies during the pandemic.

The positive impact of the pandemic on biodiversity conservation

Reduced Atmosphere Pollution

Globally, there have been problems of pollution and carbon emissions throughout the world. However, the challenges of pollution reduced with improved air quality and the environment since the inception of the Covid-19 pandemic owed to industries and transport shut down. Besides, there will be a reduced impact on marine systems because of the decline in shipping worldwide.

NO_2 is one of the primary driver of air quality degradation in industrialized and urban areas. During the total lockdown period the NO_2 contents substantially decreased on average by 40%. At present pandemic has done a great favor to the atmosphere and the environment at large.

Reduced Human Pressure on Wildlife

The exploitation of wildlife resources may reduce as protected areas (PA s) staff expected to continue with anti -poaching patrol invariably, vulnerable species are guarded. This increase the possibility of restoring wild animals to their natural environment without being disturbed by human or poaching activities The natural environment will be more enriched as a new flush of animals with vegetation will sprouts out because of low anthropogenic pressure. For instance, Covid-19 improved conservation in the protected areas of Nepal. However, Wittig stated that aggressive global counter wildlife trafficking measures during the Covid-19 pandemic diminish the operations or supply chain of the wildlife traffickers and demand of the consumers in the long term.

The negative impact on biodiversity

Loss of skilled personnel and funds

Economically, pandemics imposes high financial coasts on both government and conservation organization. The highly trained staff lost to a pandemic is devastating in developing countries where conservation capacity is limited.

Ineffective and lukewarm staff

Absenteeism will be on the rise among the personnel. Psychologically staff members will choose to care for their sick relatives than going to work This personnel attitude led to an increased number of poaching incidents, deforestation, wildlife loss in Uganda and Cambodia during the lockdown period in the year 2020.

Weakened performance in the protected area

Practically there will be little or no management of patrols for the superior officers to mandate patrol are all home with their family because of the lockdown. Therefore the rangers will not be effective in patrols around the park and making it possible for poachers neighboring the PAs to gain easy access and poach the wildlife resources. An increase in the rate of illness and deaths among the protected area rangers, senior officials, guards and other conservation bodies' personnel will weaken their performance in the protected areas. This situation occurs when the wildlife staff finds it difficult to execute their duties and enforce the law when sick.

Reduced revenue and staff strength

Tourism revenue is the source of funding for protected area agencies. It provides the means for livelihood improvement of local communities and national development through foreign exchange. Loss of tourism revenue in protected areas leads to joblessness through staff dismissal and non organized monitoring programs.

Lack of research, assessment, and monitoring on biodiversity

The inability to conduct research and identify the changes in the elements of biological diversity through monitoring programmes in a protected areas speed up the rates of loss. Lockdown and social distancing because of the pandemic will inhibit rangers and other conservation scientists to provide information on the trends in primary species and other aspects of PAs. Many research, internships or industrial training in wildlife or biodiversity conservation disrupted. Researcher can no longer conduct field based social research that requires interviews or focus groups because of the possibility of disease transmission. The continuous shortage of funds can be the fundamental barrier to biodiversity assessment. This fund shortage acerbates the unprecedented global recession driven by Covid-19 pandemic.

Conclusion

Covid-19 remains a threat to biodiversity conservation through tourism revenue loss in PAs. The financial loss affects the budget, population monitoring or assessment programs, and job loss to negative human behavior that drives human wildlife conflicts and natural resources destruction. Finally it can be said that there is a need to end the illegal wildlife trade globally to prevent future pandemic and biodiversity loss.

Reference

https://www.frontiersin.org/journals/water/articles/10.3389/frwa.2021.635529/full

Mystery of Dream

Amiya Mandal,
5th Semester, Department of Zoology

A dream is a series of mental experiences, including images, thoughts, emotions, and sensations, that typically happen during specific stages of sleep. It has captivated human curiosity for centuries, yet their origin and function remain a subject of debate. To understand the mysterious realm of dreams, it's essential to explore the stages of sleep.

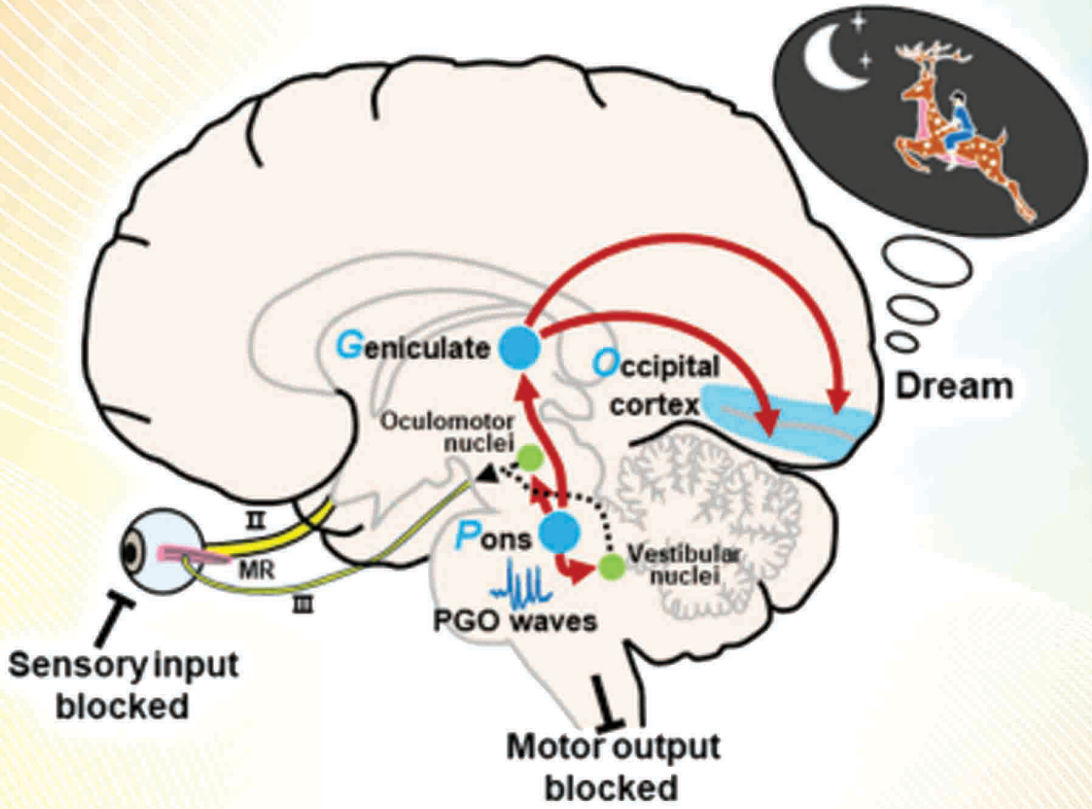
Sleep is not a uniform state but a dynamic process with distinct phases. Among these phases, Rapid Eye Movement (REM) sleep stands out as the stage where the most vivid and memorable dreams occur. Characterized by rapid eye movements and heightened brain activity, REM sleep has a purpose that is still under discussion. Researchers believe it plays a crucial role in memory consolidation and emotional processing.

During Rapid Eye Movement (REM) sleep, the stage where most dreams occur, our bodies undergo a remarkable process. While we dream, our brains temporarily paralyze our muscles. This is called "REM atonia."

REM atonia prevents us from physically acting out our dreams. Imagine how chaotic and potentially dangerous it could be if we could move as freely during dreams as we do while awake! This temporary muscle paralysis is essential for our safety during the vivid and sometimes intense experiences of REM sleep.

When it comes to dream generation, scientists have proposed that the brainstem and forebrain play essential roles. The Activation-Synthesis model, introduced by Hobson and his colleagues in 1977, presents a compelling theory. It suggests that during REM sleep, neural activity in the brainstem's pons

activates various brain regions, including the lateral geniculate nucleus (LGN) and visual cortex. These activations create internal inputs that randomly stimulate sensorimotor information, leading to the passive synthesis of perceptual, conceptual, and emotional elements, forming dreams. Ponto-geniculo-occipital (PGO) waves from the pons continuously activate the forebrain during this process. Sensory inputs are blocked in REM sleep, intensifying the impact of internal inputs. Motor outputs are also inhibited to prevent physical movements based on dream content.



Dreams exhibit diversity, reflecting different aspects of our lives. Sometimes they make logical sense, while at other times, they defy logic. The content of dreams can vary by gender and age. For instance, men often dream about strangers, violence, sexual activities, work-related scenarios, or personal achievements. In contrast, women tend to dream more about family, children, love, emotional events, and indoor matters. Occasionally, dreams provide unique insights and solutions to significant problems or questions in our waking lives. The famous example of German chemist August Kekule dreaming about a snake eating its own tail, leading to the discovery of the benzene ring structure, highlights the potential creative power of dreams.

A lucid dream is a type of dream in which the dreamer becomes aware that they are dreaming while they are still in dream. It is a trainable skill. In this dream, the dreamer has power to control over the dream characters, narrative, or background of the dream. Cultural beliefs and mysteries surrounding dreams are prevalent across different societies. In the past, the dreams of many kings and leaders were sometimes interpreted as evidence of their destiny or truth.

Bacterial Communication: The Key to Virulence and Biofilm Production

Sudip Bakshi,
5th Semester, Department of Botany

Quorum sensing (QS) serves as a sophisticated communication system among bacteria, enabling them to coordinate and synchronize their behaviors in response to changes in population density. This process relies on the production, detection, and response to extracellular signaling molecules known as auto-inducers (AIs). AIs accumulate in the environment as bacterial numbers increase, allowing the organisms to gauge their population density and collectively adjust gene expression in a concerted manner. Despite differences in regulatory components and molecular mechanisms, all known QS systems depend on three basic principles.

First, the members of the community produce AIs, which are the signaling molecules. At low cell density (LCD), AIs diffuse away, and, therefore, are present at concentrations below the threshold required for detection. At high cell density (HCD), the cumulative production of AIs leads to a local high concentration, enabling detection and response.

Second, AIs are detected by receptors that exist in the cytoplasm or in the membrane.

Third, in addition to activating expression of genes necessary for cooperative behaviors, detection of AIs results in activation of AI production. This feed-forward auto-induction loop presumably promotes synchrony in the population.

In Gram-positive bacteria, QS mechanisms involve the use of peptides called autoinducing peptides (AIPs) as signaling molecules. These AIPs are processed, secreted, and then detected by membrane-bound two-component signal transduction systems. Specialized transporters are necessary to secrete AIPs, as the cell membrane is impermeable to peptides. The detection of extracellular AIPs by membrane-bound sensor kinases triggers a phosphorylation cascade, ultimately leading to the activation of QS-target genes. Importantly, the production of AIPs also activates their own production, creating a positive feedback loop that enhances synchrony in the bacterial population. This intricate system allows Gram-positive bacteria to engage in cooperative behaviors such as bioluminescence, sporulation, and biofilm formation.

On the other hand, Gram-negative bacteria employ small molecules, specifically acyl-homoserine lactones (AHLs), as AIs in their QS systems. AHLs are produced by enzymes like LuxI and diffuse freely across bacterial membranes. At high cell density, AHLs bind to cognate cytoplasmic LuxR-like transcription factors, preventing their degradation and enabling them to activate target gene transcription. This binding also stabilizes the LuxR-like proteins, allowing them to bind to DNA and initiate the expression of QS-related genes. Additionally, AHL-bound LuxR-type proteins often activate the expression of their own synthase genes, creating a positive feedback loop that further amplifies the QS response.

One of the significant outcomes of QS activity is the formation of bacterial biofilms, complex communities of bacteria encased in a self-produced matrix of extracellular polymeric substances (EPS). Formation of the biofilm comprises several steps, namely, the attachment, cell-to-cell adhesion, expansion maturation and dispersal. QS plays a crucial role in coordinating these stages, regulating the production of EPS and controlling the expression of genes involved in adhesion and biofilm maturation. Bacterial multiplication leads to the development of microcolonies, which become encapsulated in a layer of hydrogel, that functions as a boundary between the microbial community and the external environment indicates the main characteristics of the biofilm formation phases which involves -

Adhesion of planktonic cells.

Formation of an extracellular polymeric substance (EPS) matrix.

Accumulation of multi-layered clusters of microbial cells.

Biofilm maturation.

Detachment and dispersal of planktonic bacteria.

Biofilms hold immense clinical relevance, particularly in chronic infections, as they enhance bacterial resistance to antimicrobials and immune responses. Approximately 80% of bacteria causing chronic infections produce biofilms, making them a major concern in healthcare settings. QS not only orchestrates biofilm formation but also influences virulence, as it controls the expression of genes related to the secretion of virulence factors.

The understanding of QS mechanisms has opened new avenues for innovative therapeutic strategies. By disrupting QS signaling, researchers aim to prevent biofilm formation and reduce bacterial virulence, ultimately mitigating the impact of bacterial infections on human health. Continued research in this area holds the promise of developing novel therapies that can combat biofilm-associated infections effectively, offering hope in the ongoing battle against antibiotic-resistant bacteria and chronic infections.

Reference

https://www.ncbi.nlm.nih.gov/pmc/, https://oar.princeton.edu/,
https://www.cell.com/

Urban Growth and associated Environmental Impacts in Bankura Municipality

Joydip Das,
5th semester, Department of Geography

Urbanization is a global phenomenon with profound implications for both society and the environment. As cities expand at an unprecedented rate, it becomes imperative to monitor this urban growth closely and assess its impact on the surrounding environment. This article delves into the significance of urban growth monitoring and the potential consequences it may have on the delicate ecological balance. Remote sensing has great potentials in studying urban environments and urban/suburban landscape when high spatial resolution imagery is available (Jensen and Cowen, 1999). An important part of urban monitoring is to obtain information about the geometric elements of urban setting. Studies have exposed that entropy is a good statistic for measuring the spatial distribution of various geographic phenomena (Batty, 1972). Rapid urban development and impressive change of landscape have been recently witnessed in some developing countries as a result of rapid economic development. Mukherji, S. (2005) quarrel that slump as a pattern or a process is to be distinguished from the causes that bring such a pattern about or from the consequences of such patterns. This statement clearly utters that analysis of pattern and process should be differentiated from the analysis of causes and consequences. Remote sensing data are more widely used for the analysis of pattern and process rather than causes or consequences.

The municipal town of Bankura is located centrally within the district of bankura, South-Western part of West Bengal. The geographical location of Bankura Town is 87-3'-36'' East Longitude and 23-14'-24'' North Latitude. It is the headquarter of the Bankura District. The town is 35km away from the industrial town Durgapur. It is at a distance of around 250km from the state Capital Kolkata. The town is for municipal purposes include the adjoining villages of Rampur, Nutanchati, Kenduadihi, Rajagram, Patpur, Gopinathpur etc. The town proper is however little more than a mile in length from west to east and slightly over half a mile in breadth from north to south. Bankura Town achieved its municipal status in 1865. The town covers an area of 19.06 sq/km.

The details of the satellite data used in this study are Google Earth Image of Dec-16, 2016 and April -19, 2023 using Google Earth Pro software.

This study is an applied one and the methods of investigation are both descriptive and analytical. To identify and monitor the urban growth this paper used some method. With the help of Google Earth 2016 and 2023 satellite images, I identified the built-up areas of Bankura Municipality with some polygons and then we opened those polygon files in the QGIS software and create a final output by overlapping the two files to explain the urban growth of Bankura municipality area.

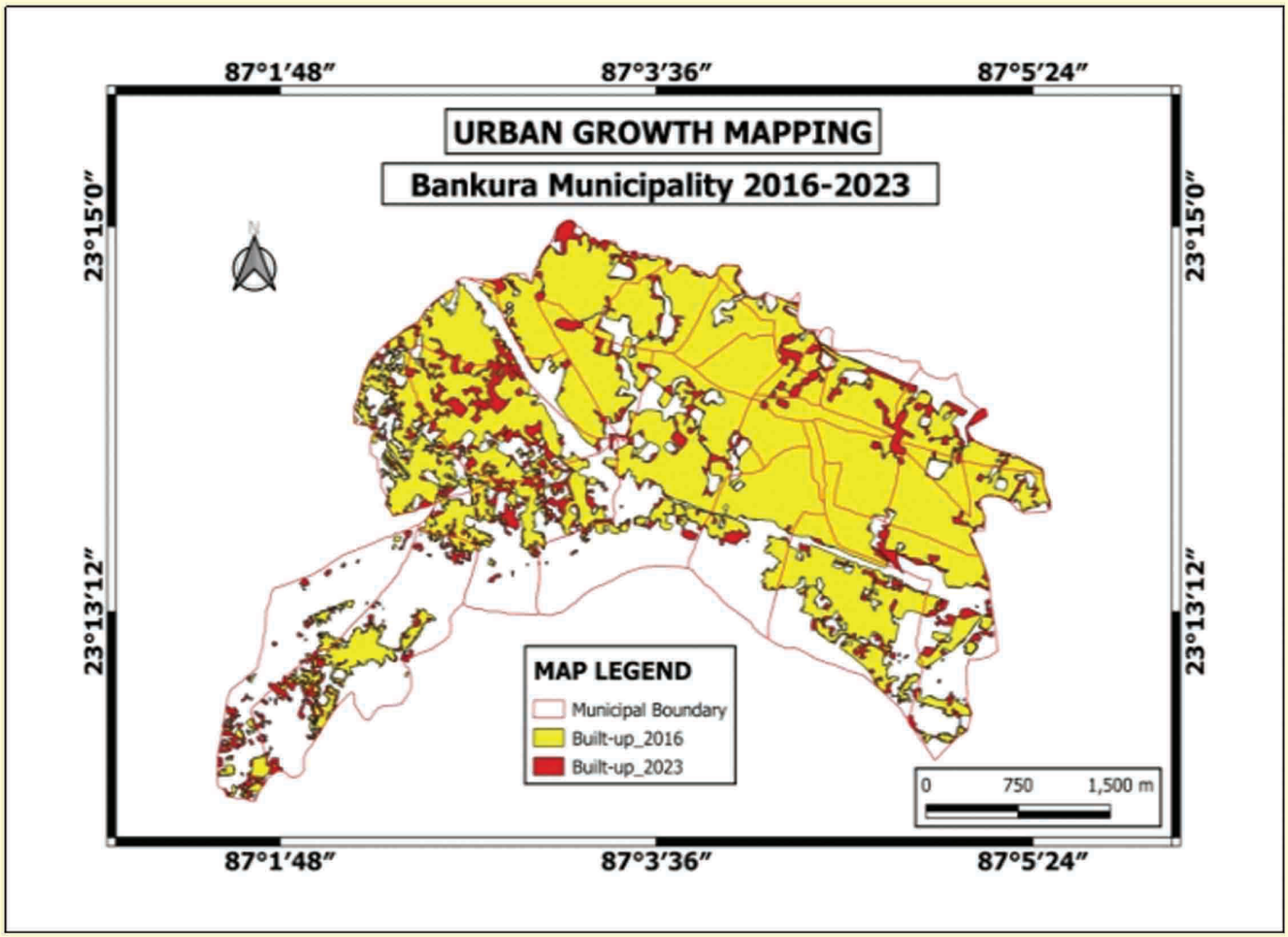


Figure-1: Urban Growth Pattern in Bankura Municipality

The monitoring of urban growth patterns is crucial for understanding the environmental consequences of urbanization. In this study, we employed satellite imagery from Google Earth Pro and GIS techniques, specifically QGIS, to analyze the spatial extent and temporal dynamics of urban growth in the study area Bankura Municipality. The results revealed a significant increase in built-up areas, primarily at the expense of agricultural and forested lands. This expansion has been driven by a combination of factors, including population growth, economic development, and infrastructure expansion. Image of Satellite imagery showing the extent of urban growth in the Bankura Municipality (2016-23) [fig-1].The built-up area extraction of bankura municipality has been observed that the value of built-up area in 2016 was 8.32sq.km, where the value of built-up area in 2023 has been increased into 9.80sq.km. Therefore, we can see that the built-up area has increased by (9.80-8.32)=1.48 sq.km in 7 years leaving huge impact on environment which are summarized below.

The Ecological Effects of Urban Sprawl are-Development plans that promote sprawl have a number of consequences for local ecosystems (Luther, 2005). Many hold true for any development in the wild land-urban interface. Ex-Destruction of wildlife habitation.

Urban areas are major sources of air pollutants, such as particulate matter (PM), nitrogen oxides (NOx), and sulfur dioxide (SO2). These pollutants can cause respiratory problems, heart disease, and other health problems, Introduction of non-native invasive plants and animals into natural areas, Increased human and pet exposure to diseases such as rabies and Lyme disease, Increased risks of water pollution from oil and gasoline washing off paved surface sand from pesticides, lawn fertilizers, and other chemicals, Increased potential for flooding and soil erosion due to impervious surfaces such as concrete or pavement , Decrease in groundwater for wells and irrigation caused by abundance of impervious surfaces , Increased risk to life and property from wildfires.

The Social and Economic Effects of Urban Sprawl are-Urban sprawl can also negatively affect social and economic conditions in communities in several ways (Luther, 2005). Ex-Increased community costs for maintaining roads, school bus routes, sewers, and other services needed when and residences are spread out. Ongoing increases in property taxes to meet growing need for services, which may pressure rural landowners to sell to developers, Increased need for automobiles; increased noise, traffic, pollution; reduced potential for bicycling and walking, Isolation of the young, poor, and elderly who cannot drive or lack access to cars, Increased cost and difficulty of providing public transportation, Increased time needed for transportation reduces time available to spend with family and friends or contributing to the com-munity, Loss of agricultural and forestry jobs, and traditional land practices, Reduction of rural character or community sense of place, Increased ordinances that regulate logging, noise, or odors.

Mitigation Strategies

To mitigate the negative environmental impacts of urban growth, it is essential to implement a range of sustainable practices and policies. These include:

i) Promoting sustainable transportation options.

ii) Encouraging the use of public transportation, cycling, and walking can reduce air pollution and greenhouse gas emissions.

iii) Implementing stricter air and water quality regulations.

iv) Setting stricter standards for air and water emissions can help to protect public health and the environment.

v) Protecting and conserving natural areas.

vi) Preserving natural areas can help to maintain biodiversity, provide ecosystem services, and mitigate the heat island effect.

vii) Implementing green infrastructure practices.

viii) Incorporating green spaces, rain gardens, and green roofs into urban design can help to improve air quality, reduce stormwater runoff, and mitigate the heat island effect.

ix) Promoting energy efficiency and renewable energy sources.

x) Reducing energy consumption and switching to renewable energy sources can help to reduce greenhouse gas emissions and mitigate climate change.

Monitoring the growth of built-up areas at regional level has been attempted by various authors using the google earth pro . Researchers have worked out to delineate built-up regions from diverse remotely sensed data. This paper has surveyed to identify built-up regions and there growth in the entire study area. Similarly from the built up area extraction of bankura municipality has been observed that the value of built area in 2016 was 8.32sq.km, where the value of built up area in 2023 has been increased into 9.80sq.km therefore, it has huge impact on environment.Urban growth is a complex and multifaceted phenomenon with far-reaching implications for the environment. While urbanization can bring economic and social benefits, it also poses significant environmental challenges. By carefully monitoring urban growth patterns using tools like Google Earth Pro and QGIS and implementing sustainable practices, cities can work towards fostering healthy and livable environments for their residents while minimizing the environmental footprint of urban growth.

References

1. Batty, M., and Kim, K.S. Form Follows Function: Reformulating Urban Population Density Functions. Urban Studies. 1992. 29; 1043-1070.
2. Burchell, R.W., Downs, A., McCann, B. and Mukherji, S., 2005: Sprawl Costs. Economic Impacts of Unchecked Development. Washington, Covelo, London: Island Press.
3. Carruthers, J.I. and Ulfarsson, G.F. Urban Sprawl and the Cost of Public Services. Environment and Planning B. 2003. 30; 503-522.
4. Ceccato, P., Gobron, N., Flasse, S., Pinty, B. and Tarantola, S. Designing a Spectral Index to Estimate Vegetation Water Content from Remote Sensing Data: Part 1: Theoretical Approach. Remote Sensing of Environment. 2002. 82; 188-197.
5. Chen, Z.M., Babiker, I.S., Chen, Z.X., Komaki, K., Mohamed, M.A.A. and Kato, K. Estimation of Interannual Variation in Productivity of Global Vegetation Using NDVI Data. International Journal of Remote Sensing. 2004. 25 (16) 3139-3150.
6. Ewing, R., Pendall, R. and Chen, D., 2002: Measuring Sprawl and Its Impact. Smart Growth America. Washington D.C.
7. Gao, Bo-Cai. NDWI- A Normalized Difference Water Index for Remote Sensing of Vegetation Liquid Water from Space.Remote Sensing of Environment. 1996. 58 (3) 257-266.
8. Jensen, J.R. and Cowen, D.C. Remote Sensing of Urbanl Suburban Infrastructure and SocioEconomic Attributes.Photogrammetric Engineering 9 Remote Sensing. 1999. 65 (5) 611-622.

Assessment of Drinking and Surface Water Quality in Bankura Municipality

Anwesha Pal,
Semester-V, Department of Geography

In India demand of water resources continuously increases with the advent of industrialisation and population expansions. Hence, assessment, planning and management of water resource becomes crucial and essential phenomena. A large part of India's population is dependent on groundwater as the major source of potable water. Contamination of groundwater is a major issue in parts of the country, potentially leading to serious health hazards for the affected populations. The Ministry of Drinking Water and Sanitation (MoDWS) has launched a national submission for Sustainable Drinking Water Supply in Habitations affected by Arsenic and Fluoride Contamination in Groundwater to improve drinking water quality as a part of its ongoing National Rural Drinking Water Program (NRDWP).Government of India (GoI), through MoDWS, has prepared the submission and is committed to supporting the affected states in implementing programs to provide Arsenic and Fluoride free drinking water to the affected population by 2020, and is working with the states in identifying the measures to do so. West Bengal is one of the States, critically affected by ground water contamination of both Arsenic and Fluoride. A whopping 69% of the total population affected by Arsenic contamination is from West Bengal, whereas it has 6% of the total population affected by Fluoride contamination. In line with the national objectives, Government of West Bengal (GoWB) has decided to provide safe and acceptable drinking water supply in sufficient quantity to priority areas of North 24 Parganas, Murshidabad, Hoogly, and Bradhaman as the top four priority districts for Arsenic mitigation andBankura, Birbhum, Dakshin Dinajpur and Uttar Dinajpur as priority districts for Fluoride mitigation.

Study Area

Here we have been chosen each and every wards of Bankura Municipality for collection of water samples. Geographically, this Municipal area is located in the water divide of two rivers- Dwarakeswar and Gandheswari. Both of the rivers are carrying the runoff of the rain water, basically in monsoon Season and another time, both rivers beds have been water less. This area have many educational institutions (schools, colleges), residences, hospitals, stores etc and all of the administrative offices are located here.

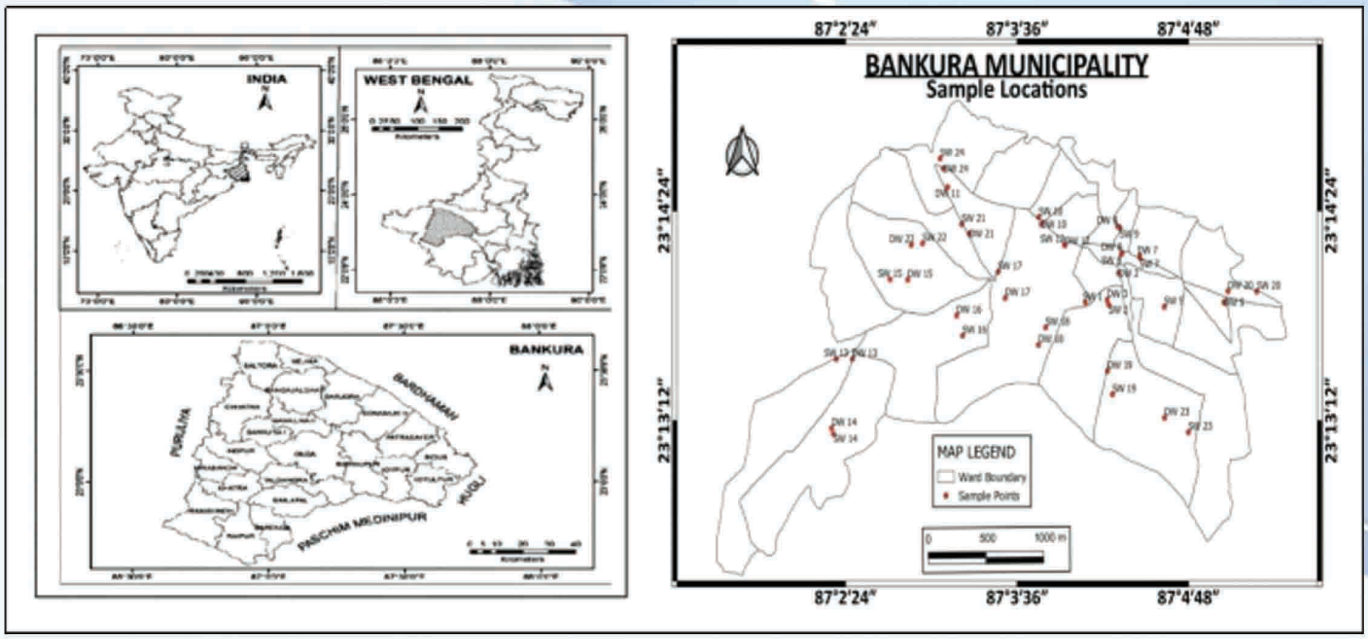


Figure-1: Location of Study Area

Bankura Municipality at a Glance

Location - 23°14'N Latitude and 87° 04 E Longitude

Total Area - 19.06 Sq/km

No. of wards – 24

Climate - Tropical and sub-humid.

Temperature - Maximum-49°C, Minimum- 9°C

Annual Rainfall - 1402 mm

Sources of ground water – River beds of Dwarakeswar and Gandheswari

Total population – 1,37,386 persons. (according to 2011 census) male- 69843 persons , Female- 67543 persons

Population Density - 7208.07 persons /sq (according to 2011 census)

To get the primary data for this particular paper we have used the tool 'water container' to collect the water. After collecting water samples from each ward, we wrote down every sources name (Drinking water or surface water) and Longitudinal and Latitudinal location on some piece of paper for each water samples and Stick it on the water containers. Then we had taken the water samples to our departmental Laboratory room. Next day we estimated the pH level of water and then EC, TDS values by water testing machine. For measuring the quality of drinking and surface water, several instruments are used to determine parameters such as pH, EC (Electrical Conductivity) and TDS (Total Dissolved solids). The instruments used for these measurements are:

PH meter: A pH meter is an electronic device used to measure the acidity or alkalinity of a solution. It consists of a probe that is inserted into the water sample, which then measures the voltage generated by the sample and converts it into a pH value. pH meters provide accurate and precise readings of PH levels.

Conductivity meter: A conductivity meter measures the electrical conductivity of a solution, which is directly related to its ionic content. It is commonly used to determine the salinity or dissolved solids concentration in water. Conductivity meters typically have built-in probes that are placed in the water sample and they provide readings in units of electrical conductivity, such as microsiemens per centimetre (µS/cm) or Millisiemens per centimeter (ms/cm^3).

TDS measurement: Total dissolved solids were calculated indirectly from electrical conductivity values in µS. Total dissolved Solids = 0.65 * EC(s/cm)

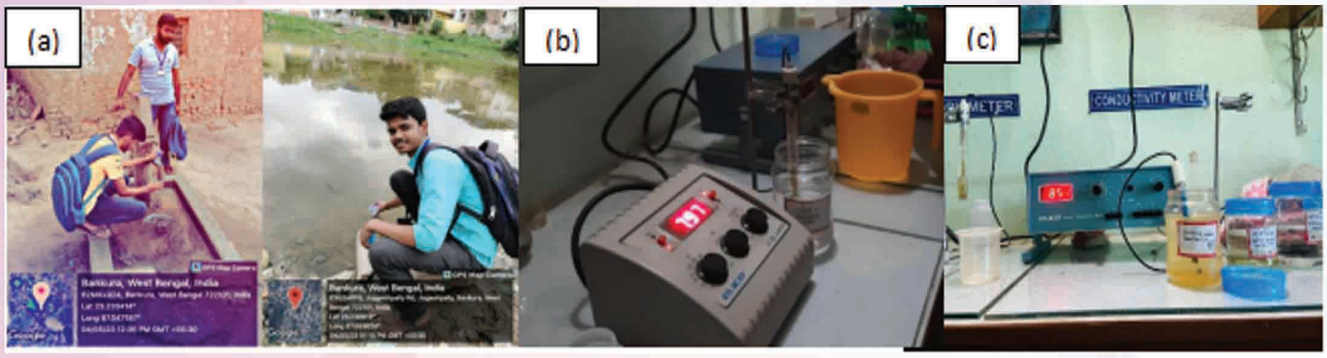


Figure-2: Collection of Samples (a), Testing Instruments- pH Meter (b), Conductivity Meter (c)

On the basis of data from the field we have some results like pH, EC and TDS with the help of water testing machine. Then we discussed the quality of surface and ground water of the 24 wards in Bankura municipality. The below table showed the pH, EC and TDS values of 24 wards of Bankura municipality

1. Surface Water Quality

Surface water which includes rivers, lakes and pond is a vital natural resource that support various ecosystems and provides water for human consumption, agriculture and industrial processes. However, the quality of surface water can be compromised by natural processes and human activities, resulting in pollution and degradation.

i.pH Level- The pH level of surface water is an important indicator of its quality and can have significant implications for aquatic life and ecosystem health. The pH Scale measures the acidity or alkalinity of a solution and ranges from 0 to 14, with 7 being considered neutral ,values below 7 indicate acidity; while values above 7 indicate alkalinity. We have tested the Ph level of surface water from 24 wards of Bankura Municipality. The water from ward 13 has the highest PH level thus being basic. The water from ward 15, 16 has the lowest ph being acidic. Majority of the Samples most of the time showed less than 7 pH (Acidity type). In general, surface water bodies should have a pH level within the range of 6.5-8.5, as this supports a healthy aquatic ecosystem some of wards under the Range.

Table-1: Water Quality Analysis (Surface Water)

Ward No.	Sample No.	longitude	latitude	PH	EC	TDS	WPI
1	SW 1	87.06797222	23.23125	6.25	1005	653.25	115.19
3	SW 3	87.07069444	23.23102778	6.16	1062	690.3	119.60
5	SW 5	87.07718667	23.23084	5.76	1237	804.05	132.57
6	SW 6	87.18722222	23.385	6.48	1067	693.55	121.55
7	SW 7	87.07434306	23.23552639	5.79	1310	851.5	138.92
8	SW 8	87.07213444	23.23586472	5.4	885	575.25	100.94
9	SW 9	87.07196361	23.23840222	5.5	1045	679.25	115.02
10	SW 10	87.062525	23.239375	5.88	750	487.5	91.75
11	SW 11	87.0519	23.24227222	6.4	745	484.25	93.80
12	SW 12	87.06551944	23.23675	6.26	825	536.25	99.93
13	SW 13	87.03841917	23.22640278	7.11	1435	932.75	155.83
14	SW 14	87.03860361	23.21873194	6.83	1153	749.45	130.53
15	SW 15	87.04518639	23.233455	5.38	1004	652.6	110.96
16	SW 16	87.05366	23.22810667	5.38	819	532.35	95.23
17	SW 17	87.05777778	23.23416667	6.62	649	421.85	86.69
18	SW 18	87.06333333	23.22888889	6.31	854	555.1	102.64
19	SW 19	87.07111111	23.2225	5.43	907	589.55	102.95
20	SW 20	87.08798	23.232295	5.51	1099	714.35	119.65
21	SW 21	87.05353611	23.23871667	6.69	585	380.25	81.58
22	SW 22	87.04897806	23.23688806	6.82	1190	773.5	133.63
23	SW 23	87.08	23.21888889	5.48	521	338.65	70.38
24	SW 24	87.05102778	23.24498889	5.52	825	536.25	96.41

Source: Calculated by the Author

ii. Electrical Conductivity- Electrical conductivity is an important parameter used to assess the quality of surface water. It is a measure of the water's ability to conduct an electrical current and is influenced by the presence of dissolved ions and minerals. High electrical conductivity in surface water can indicate the presence of elevated levels of dissolved salts and minerals. We have measured the EC value of surface water from 24 wards. The Surface water from 13 no. ward has the highest EC value while the surface water from 23 no. ward has the lowest EC value. From the above table we can see that EC value of surface water of 5 wards in Bankura municipality is between 0 to 800 s/cm which means that all these ponds have very low tendency of electric current and also low salinity. Between this range surface water generally good for irrigation & suitable for all livestock. Again we can see that EC value of surface water of 17 wards in Bankura municipality is between 800 and 1500 s/cm which means that the water collected from the ponds of these wards has the highest tendency to conduct electricity. In this range surface water moderate to poor quality when used for irrigation, requires special management including suitable soils, good drainage and consideration of salt tolerance of plants.

iii.TDS (Total Dissolved Solids) - TDS is a measurement of the combined concentration of inorganic and organic substances that are dissolved in water. It is an important parameter used to assess the quality of surface water. We have measured the TDS values of surface water from 24 wards. The surface water from 7 no. ward has the highest TDS value, while the surface water from 21 no. ward has the lowest TDS value. High levels of TDS is the cause of aesthetically displeasing colour, taste and odour of the surface water in study area.

2. Drinking Water Quality

Access to safe and clean drinking water is essential for maintaining good health and wellbeing. The quality of drinking water is determined by various factors, including pH level, electrical conductivity and Total dissolved solids (TDS) context. Monitoring these parameters is crucial to ensure the safety and suitability of drinking water for human consumption.

Table-2: Water Quality Analysis (Drinking Water)

Ward No.	Sample No.	longitude	latitude	PH	EC	TDS	WPI
1	DW 1	87.10222222	23.38361111	4.94	806	523.9	92.03
2	DW 2	87.07183333	23.23405278	4.93	990	643.5	107.63
3	DW 3	87.0705	23.2315	4.97	1045	679.25	112.49
4	DW 4	87.14222222	23.38833333	5.85	1160	754	126.46
5	DW 5	87.08416667	23.23127	5.67	926	601.9	105.71
6	DW 6	87.13666667	23.38861111	5.13	1207	784.55	127.02
7	DW 7	87.07434306	23.23565833	6.23	813	528.45	98.77
8	DW 8	87.07223889	23.23596667	6.08	730	474.5	91.00
9	DW 9	87.07171194	23.23851194	6.58	709	460.85	91.60
10	DW 10	87.06283611	23.238725	4.27	472	306.8	60.45
11	DW 11	87.0519	23.24227222	5.33	1431	930.15	147.02
12	DW 12	87.06558611	23.23671389	5.43	563	365.95	73.71
13	DW 13	87.03994472	23.22686389	6.4	557	362.05	77.82
14	DW 14	87.03838611	23.21927778	6.18	968	629.2	111.71
15	DW 15	87.04724167	23.23341472	6.23	1037	674.05	117.81
16	DW 16	87.05295333	23.230025	6.47	402	261.3	64.98
17	DW 17	87.05861111	23.23166667	6.38	733	476.45	92.69
18	DW 18	87.0625	23.22722222	6.6	884	574.6	106.57
19	DW 19	87.07055556	23.22472222	5.9	1119	727.35	123.21
20	DW 20	87.084635	23.23232167	5.31	1430	929.5	146.84
21	DW 21	87.05442778	23.23783889	5.04	602	391.3	75.17
22	DW 22	87.047655	23.23673333	6.61	444	288.6	69.22
23	DW 23	87.07722222	23.22027778	5.06	771	501.15	89.63
24	DW 24	87.05139444	23.24403333	5.37	1095	711.75	118.65

Source: Calculated by the Author

i. p^H level- The pH level of water is a measure of its acidity or alkalinity on a scale, ranging from 0 to 14. A p^H value of 7 is considered neutral, while values below 7 indicates acidity and values above 7 indicates alkalinity. For drinking water p^H range of 6.5 to 8.5 is generally considered safe. The p^H level of drinking water is Important because it affects its taste, corrosion potential and the effectiveness of disinfection processes. The data we collected in the water sample table showed that wards 9, 16, 18 and 22 has the safe p^H range (6.5 and above 6.5) and the other wards has the acidic water range (below 6.5) which is more likely to be contaminated with pollutants, making it unsafe to drink. In the Bankura municipality the ward no. 22 has highest p^H value and ward no. 10 has the lowest p^H value.

ii. Electrical Conductivity- Electrical conductivity is a measure of water's ability to conduct an electrical current which is influenced by the presence of dissolved irons, such as salts, minerals and metals. Monitoring electrical conductivity is important as excessive conductivity can indicate the presence of pollutants or naturally occurring substances that may affect the taste, odor and suitability of water for drinking. In the Bankura Municipality the ward no. 11 has the highest EC value and the ward no. 16 has the lowest EC value. 500 s is the permissible EC value recommended by Central Ground water Board and here some of the samples in the table has less than 500 s conductance which is good drinking water for humans (provided there is no organic pollution and not too much suspended clay material).

iii. TDS- TDS refers to the total concentration of inorganic and organic substances dissolved in water including minerals, salts, metals and other compounds. High TDS levels can affect the taste, clarity and suitability of drinking water. While some minerals are benificial to human health, elevated TDS level may indicate the presence of harmful containments or excessive mineralization or heavy metals. The recommended TDS level by the BIS is between 100-500, but Local standards may vary. The TDS values we prepared from the EC values in the water sample table showed that ward no 8,9, 10, 12, 13, 16, 17, 21 and 22 has the safe TDS range (100-500) and the other wards has the high TDS range (above 500). In the Bankura municipality ward no. 11 has the highest and ward no. 16 has the lowest TDS value.

Ambient Drinking Water Quality Standard

1. World Health Organization (WHO): The WHO has developed guidelines for drinking water quality, which provide a framework for the evaluation and monitoring of drinking water safety. These guidelines are widely recognized internationally. The WHO sets standards for various contaminants, including microbial agents, chemicals and radio logical hazards, taking into account the potential health risks associated with exposure to these substances. The WHO suggests that the pH of drinking water should ideally be between 6.5-8.5 and TDS levels in drinking water should be below 600 mg/L for aesthetic reasons and EC value should be interpreted in conjunction with other parameters to assess the overall water quality.

2. **Bureau of Indian standards (BIS):** The BIS is the national standards body in India and has established the Indian drinking water standards (IS 10500:2012).These standards outline the quality requirements for drinking water in India. The BIS standards cover various parameters such as physical, chemical and bacteriological parameters, including permissible limits for substances like toxic metals, pesticides and microbial contaminants. BIS suggests that the pH of drinking water should be range between 6.5-8.5 and the upper limit of TDS levels in water is 500ppm.

Water Pollution Index

The water pollution Index is a specific index used in some countries to evaluate the pollution status of water bodies. It takes into account parameters such as pH, dissolved Oxygen, BOD, COD, ammonia, nitrate, phosphate and faecal coliform.

WPI value	Rating
0-25	Excellent water quality
26-50	Good water quality
51-75	Fair water quality
76-100	Poor water quality
>100	Very poor water quality

Each parameter is assigned a weight and the individual scores are combined to calculate the index value. The index generated ranges between 0 and 1. A WPI value below 0.5 means excellent, values of 0.5-0.75 is good water quality, 0.75-1 is moderately polluted water and finally values higher than 1 represent highly polluted water.

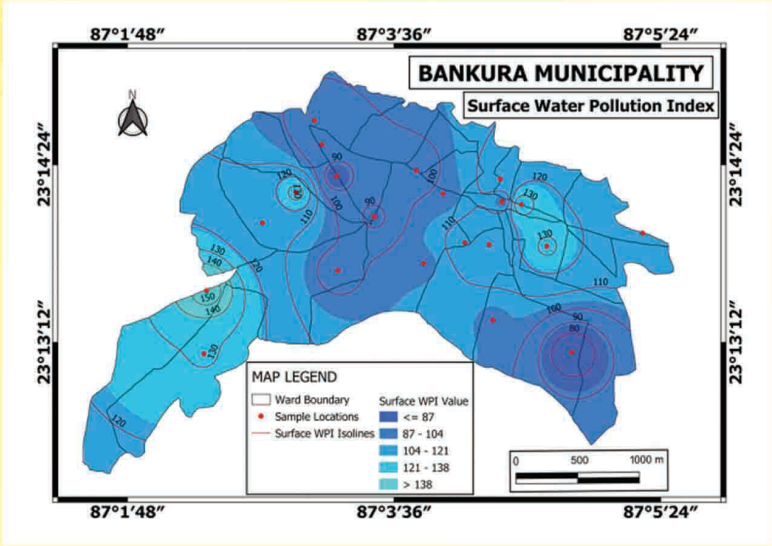


Figure-3: Surface Water Pollution Index

The water pollution Index (WPI) is a measurement that provides an interpretation of the overall quality of water in a given area. It is commonly used to assess the degree of contamination and pollution in water bodies such as rivers, lakes and coastal areas. The WPI takes into account various parameters and indicators to evaluate the potential harm Caused by pollutants present in the water.

Interpreting the water pollution Index involves understanding the numerical scale used and corresponding level of water pollution. Generally higher index values indicate more severe pollution. Here is a common interpretation scale for the water pollution index.

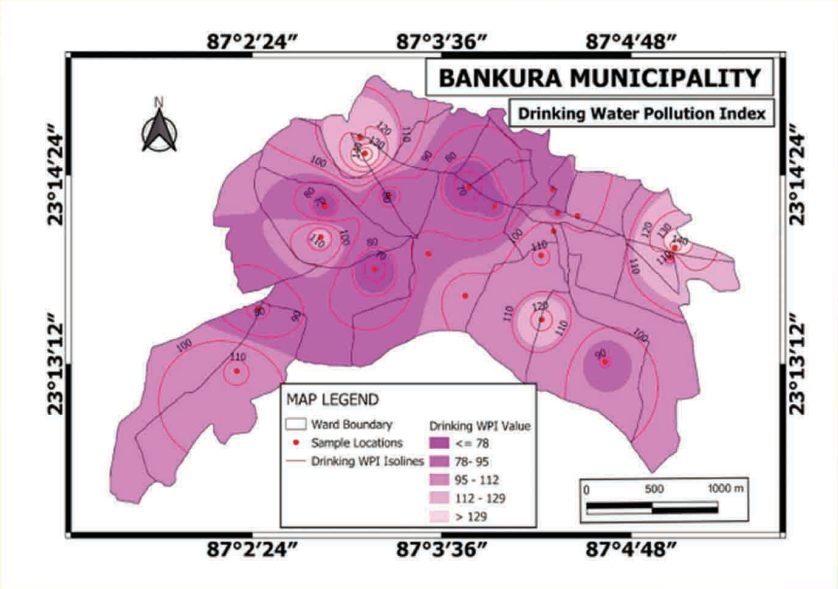


Figure-4: Drinking Water Pollution Index

From the map here we can see that most of the wards of Bankura municipality are very poor water quality (WPI Value exceeding 100). This indicates severe pollution, with potential catastrophic effects on ecosystems, drinking water supplies, and human health. Water in this range requires immediate remedial measures to restore its quality.

Overall doing after this activity it is clear that some wards of Bankura Municipality has been high pH, EC , TDS value and few have moderate types and some of wards are low values. The results of the case study implies that the surface water of the wards from Bankura Municipality has excess growth of moss, water hyacinth (kachuripana) and many household practices results to the accumulation of waste materials in the water. It deteriorates the cleanliness of the water. Blue algae propagates faster in this water and this endangers the ecosystem. Additionally, waterborne diseases Increases. According to the research the pH, TDS and EC values of the drinking water from ward nos. 9, 16, and 22 was in the safe range and here the source of the drinking water was mostly surface water.

References

1. Accessed from : https://www.mdpi.com/2073-4441/15/4/680
2. Accessed from: https://sensorex.com/electrical-conductivity-water-important-industrial-applications/#:~:text=The%20reason%20that%20the%20conductivity,lead%20to%20a%20higher%20conductivity
3. Accessed from: https://sudawb.org/uploads/digitaldoc/PMAY/DPR/BANKURA%202018-2019/001.pdf
4. Accessed from: https://www.researchgate.net/publication/289495980_ An_Assessment_of_Drinking_Water_Quality_Using_Water_Quality_Index_in_Ado-Ekiti_and_Environs_Nigeria
5. Eshraga Abd and Eimagid Bashir (2005), Assessment of the quality of drinking water in khartoum state.
6. Michel L. Kapembo, Florent B., Periyasamy S, Johnny B. Mukoko, Mathieu K. Bokolo, Crispin K. Mulaji, Pius T. Mpiana, John W. Poté (2021), Survey of water supply and assess ment of groundwater quality in the suburban communes of Selembao and Kimbanseke, Kinshasa in Democratic Republic of the Congo.
7. Naithani, S., Mathur V.B, and Rotella, P. (2013), Ground water prospect mapping of Pench Tiger Reserve (PTR), Madhya Pradesh, India.
8. Pan, S. (2018) Environmental Hazards A Study in Kumardhubi Mining Area, Dhanbad District, Jharkhand.
9. PHE, Government of West Bengal (2020), West Bengal Drinking Water Sector Improvement Project With Assistance from Asian Development Bank- Bankura District Drinking Water Quality Action Plan.
10. Sarada, P. (2016) Assessment of ground water quality of the first industrial-residential confluence area of Visakhapatnam

BANKURA CHRISTIAN COLLEGE
CAMPUS BIODIVERSITY

Established in 1903 in the biodiversity rich area of watershed boundary between Dwarakeswar and Gandheswari rivers, Bankura Christian College has been time tested and has earned its own place in the higher education map of West Bengal as well as India. The college campus is rich in biodiversity in many pockets of the college. The biodiversity park beside Principal Bungalow and Bishop's House is mention worthy. One can find students basking in the sun around the huge college tank in between their classes.

Floral Diversity

The campus is rich in flora with more than 30 tree species, 100 herbs and 10 aquatic plants. The total number of trees in the campus has been estimated to be around 1000.

Faunal Diversity

Bankura Christian College Campus is rich in terms of faunal diversity. More than 32 types of birds chirp and tweet within the campus boundary along with 59 species of butterfly, 5 mammals, 13 reptiles, 4 amphibians and 20 species of fishes with a total 133 animal species.

Neem (Azadirachta indica)

This attractive evergreen tree is very well known for its medicinal values. It is a rich source of vitamin-E which help repair damaged skin cells. It acts as immunity booster. It has strong antimicrobial and antibacterial property. The leaf extract is used for birth control and can cause abortion.

Nagkeshor (Mesua ferrea)

This beautiful hardwood evergreen tree is long known for its Ayurvedic use in treating many diseases such as inflammation, skin eruption, sore eye, etc. The fruit extract deeply clarifies and purifies the skin for an even-toned and glowing complexion. The leaf and flower extracts are used against snake and scorpion stings.

Kalmegh (Andrographis paniculata)

This is most important herb abundantly found in the campus. It has many uses of medicinal importance. Leaf juice in effective as Hepatoprotective agent. Extraction of whole plant is used as antidote for snakebite and poisonous stings of some insects.

The Great Banyan (Ficus benghalensis)

The Great Banyan in the Bishop's House compound is believed to be more than 150 years old. The original trunk can hardly be seen in the mesh of hanging aerial roots and branches. It is about 10 meters high and covers more than 500 square meters area on ground. It is said that the tree was present long before the establishment of the college.

CAUTION

The two biodiversity parks are rich in different kinds of animal species particularly poisonous snakes such as Indian Cobra, Common Krate, Viper etc. These areas are protected and movement of students is also restricted.

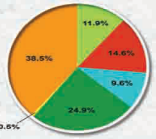
The Great Sirish (Albizia lebbeck)

You can find this grand old tree in the northern bank of the college tank opposite to Brown Hostel Main Gate. It is believed to be more than 120 years old. The Branches extend more than 15 meters with a towering height of nearly 10 meters. It gives shelter to many bird species and provide shades to the students amidst long class hours and laboratory sessions.

The rich biodiversity of the campus offers it's students a uniquely powerful context while they learn in the natural environment. it also gives unique experience to the students while roaming around the campus. The crying of birds and their varied musical sounds in the campus helps to motivate, inspire, recharge and refresh the students' exhausting minds after a day long class or a laboratory session.

HOW THE CAMPUS IS USED?

Total Area = 119 bighas / 39.34 acres



Playgrounds (Playground - A, B, C, Bonkan Ball Ground)
Buildings and Campus Roads
College Tank
Biodiversity Parks (Beside Principal Bungalow & Bishop's House)
Gardens
Open Space (Filled with scattered trees and herbs)

Biodiversity Hotspots

The college has a number of undisturbed and protected biodiversity hotspots around its campus. The biodiversity parks beside Principal Bungalow and Bishop's House are mention-worthy for their rich flora and fauna. The College Tank is another hotspot rich in aquatic plants and animals giving the campus the only aquatic ecosystem.

Palash (Butea monosperma)

Palash the native to tropical region is beautiful particularly when it blooms at the onset of spring season. The leaf juice is beneficial for secretory system. The flower with high potassium and low cholesterol content can be consumed for maintaining heart health.

Rudrapalash (Spathodea campamulata)

This African tulip tree is beautiful for its deep red flower blooming around the tree canopy and is found inside the Heritage Building in front of Chemistry Department. This tree has also medicinal value. The leaf juice is used for epilepsy and convulsion control, kidney disease, urethritis and as an antidote against animal poison.

Bhringaraj (Wedelia calandulacea)

This creeping herb is adequately found all around the campus. It is the most supporting herb for hair growth, retaining of shine and lustre of hair. Leaf juice has hepatoprotective activity and protect against greying of hair and act as anti hairfall agent. The juice is also highly effective in post-menopausal osteoporosis of women.