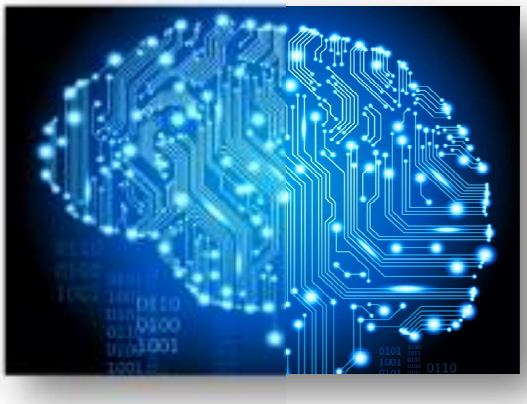
JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

Dissertation on

Deep Learning Powered Species Level Butterfly Classifier for Butterflies of Jhargram and Adjacent Areas



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Dissertation On

Deep Learning Powered Species Level Butterfly Classifier for Butterflies of Jhargram and Adjacent Areas

SUBMITTED BY

Anima Nandi

GUIDED BY

Dr.Krishnendu Sinha

Jhargram , 2022

Decleration by student

I do hereby declare that the present Dissertation entitled **"Deep Learning Powered Species Level Butterfly Classifier for Butterflies of Jhargram and Adjacent Areas"** has been carried out by me in the Department of Zoology, Jhargram Raj College, Jhargram, under the guidance of Krishnendu Sinha (Assistant Professor) Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

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To whom it may concern

This is to certify that the Dissertation work entitled **"Deep Learning Powered Species Level Butterfly Classifier for Butterflies of Jhargram and Adjacent Areas"** has been carried out by Anima Nandi student of M.Sc. (Semester IV), Depatment of Zoology, Jhargram Raj College under my guidance for the partial fulfillment of the M.Sc. 4th Semester Examination, 2022, under Vidyasagar University. The work has not been published or presented for any purpose according to my knowledge.

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I acknowledge my indebtedness to Dr. Debnarayan Roy, Principal of Jhargram Raj College for giving me the scope to present this dissertation.

I am equally thankful to Dr. Rahul Kumar Datta, Associate Professor & Head, Department of Zoology, Jhargram Raj College for the encouragement.

I pay my great regards, sincere gratitude and gratefulness to Dr. Krishnendu Sinha, Assistant Professor of Zoology, Jhargram Raj College for helpful suggestions and inspiration during the tenure of study as well as preparing this work. The presentation of the seminar and this dissertation has been possible for me for his guidance.

It is great pleasure to express my thanks to all my departmental teachers namely Shri Sanjib Kumar Das (Assistant Professor), Dr. Koushik Sen (Assistant Professor), Shri Sourav Barai (Assistant Professor), Md. Shariful Islam (Assistant Professor), Smt. Sanchita Pan (SACT) for necessary helps as and when required.

I would like to thank all of my friends who help me in various ways to carry out my dissertation work successfully.

It is impossible for me to work without the benevolence and blessing of my parents who always supported me in achieving my goals.

We have availed the facility provided by the DBT-STAR Scheme 2019-2022 Department of Biotechnology, Govt. of India.

CONTENT

Deep Learning Powered Species Level Butterfly Classifier for Butterflies of Jhargram and Adjacent Areas

Abstract

Machine Learning is an application of Artificial Intelligence (AI) where a computer or machine learns from the experience (input data) and makes future predictions. More specifically, Machine Learning is a type of Artificial Intelligence (AI) that allows software applications to become more accurate at predicting outcomes without being explicitly programmed to do so. Machine Learning Algorithms use historical data as input to predict new output values. In this paper we evaluated traditional machine learning, deep learning and transfer learning methodologies by training and testing on a butterfly dataset and determined the optimal model. The application can detect the butterfly species by either capturing a real time picture of a butterfly or choosing one picture from gallery.

Key words: Machine learning, deep learning, Artificial Intelligence, classification of butterfly.

Conclusion

Many models about classification of butterflies have been proposed in the past. Automatic identification of butterflies specifically of Jhargram is needed to help the researchers, enthusiast, and conservation of biodiversity. By the model proposed in the study the taxonomic classification of butterflies was studied. 9324 images of 74 butterfly species were used in the study. The model was run with relevant parameters. At the end of the study an accuracy degree close to 0.7728 was obtained. In future studies can continue to increase this accuracy value by increasing the working performance of the model. For this the number of layers and parameters can be changed the sampling number can be increased or techniques such as augmentation can be tried. In the study adult butterfly pictures taken in their natural area have been used to identify. The future model can also be applied to other species if they have enough pictures for training and testing. Lastly, a mobile application or app can be developed for the use of amateur butterfly watchers, enthusiasts, or curious people, whether for citizen science, hobby purpose or even for scientific studies.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

Project work on

"Gingerbread house"- A symbiotic association between jellyfish and fish.


PAPER CODE: ZOO 496B

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A PROJECT WORK

ON

"GINGERBREAD HOUSE"- A SYMBIOTIC ASSOCIATION BETWEEN JELLYFISH AND FISH.

SUBMITTED BY

MOUMITA PRAMANIK

REGISTRATION NO: 1390202-OF-2017-2018

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2022

Declaration by student

I do hereby declare that the present Project entitled **"Gingerbread house"-A symbiotic association between jellyfish and fish** has been carried out by me in the Department of Zeology, Jhargram Raj College, Jhargram, under the guidance of **Sanjib kumar das, whes,Assistant professor in zoology,**Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

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I am equally thankful to Dr.Rahul Kumar Datta, Associate Professor & Head, Department of Zoology, and Jhargram Raj College for the encouragement.

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It is great pleasure to express my thanks to all my departmental teachers Dr.Krisnendu Sinha (Assistant Professor), Dr.Kousik Sen (Assistant Professor), Sri. Sourav Barai (Assistant Professor), Md Sariful Islam (Assistant Professor), Smt. Sanchita Pan (SACT) for necessary helps as and when required.

I would like to thanks all of my friends who help me in various ways to carry out my review work successfully.

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We have availed the facility provide by DBT -STAR scheme 2019-22 Department of Biotechnology, Govt. Of India.

CONTENTS

ABSTRACT

Symbiotic interactions are really wide- ranging in nature and are also important for the species occurred in the association in aquatic ecosystems. Fish-jellyfish interactions are the part that contribute to the fish stock success. Jellyfish compete with fish for food resources or feeds on fish eggs and larvae, which reduces their survivorship. But there also have a beneficial pathway where fish is benefited from jellyfish without being affected or affecting jellyfish stock that may be shown as commensalism -1, 0. The juveniles of some pelagic fishes at a large scale show a habitual gathering or taking shelter beneath different kinds of floating objects such as - seaweed, drift, wood, wafts, sand living animals - making a non-biological relationship with them. But here in this topic it is discussed how fish jellyfish association i.e. commensalism (one type of symbiosis) occurs, breaking the non-biological relationship. Evolutionary dynamics that drive such association, would allow for their more effective incorporation into ecosystem models. Fish are of different types as benthic, pelagic, benthopelagic, abyssal, demersal. Fish associates with jellyfish are mostly pelagic (Carnagidae, Stromatiedae, Nomeidae), demersal (Gadidae), abyssal (zaproridae). There are two models by which we can explain the evolutionary significance of such association i.e., how jellyfish - demersal fish association have been evolved from non-associating pelagic fish. Though the process is complex, fish- jellyfish association is important in marine ecosystem (1,3,15).

Keywords: Fish jellyfish association, commensalism, pelagic, benthopelagic, abyssal, demersal.

CONCLUSION

Fish and jellyfish association is the topic of discussionthat indicates symbiotic relationship among them. There are five types of such association recognized among organisms --- competition, predation, commensalism, mutualism and parasitism. Commensalism is one type of symbiotic relationship between individuals of two species in which one species gets food or other benefits from the other without either harming or benefiting the latter. Fish show mutualism, commensalism with jellyfish (clownfish), parasitism between sea lice and fish. There the symbiotic relationship between fish and jellyfish breaks their as usual relationship-- i.e. - non-biological relationship. The association of juvenile of carangids with jellyfish as a temporary commensalism to protect the fish from their vertebrate predators, crab etc. in the ocean water. Fish swim around the jellyfish's umbrella and sheltered here and protected from predators by the tentacles of jellyfish. Though some jellyfish (box jellyfish) sting, some prey on them-- gut analysis showed that. They predate only phytoplankton so they gathered a huge amount of it as their food and extra-large amount of phytoplankton reach to fish juvenile. Such a pleasure of them that at one side they protected and another they get huge food easily ---- that's why it is compared with spicy breads (as phytoplankton is food i.e. juvenile mostly needed) with safe house---"Gingerbread house". But fish does not affect anyway to the jellyfish lifestyle. At the end it is concluded that they are truly in commensalism where fish is benefited totally not affecting jellyfish life.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

Project on

Effect of Climate Change on Honeybee and Potential Impact on Pollination Services

Paper Code : ZOO 496B

Roll : PG/VUJGG21/ZOO-IVS No : 003

Reg. No. : 1140020 of 2017-2018

Session : 2020-2022

Effect of Climate Change on Honeybees and Potential Impact on Pollination Services

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Declaration by student

I do hereby declare that the present Project entitled **"Effect of Climate Change on Honeybees and Potential Impact on Pollination Services"** has been carried out by me in the Department of Zoology, Jhargram Raj College, Jhargram, under the guidance of Md Shariful Islam (Assistant Professor), Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any university, and not has been published earlier anywhere.

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This is to certify that the project work entitled **"Effect of Climate Change on Honeybees and Potential Impact on Pollination Services"** has been carried out by Piya Bera, student of M.Sc. (Semester IV), Department of Zoology, Jhargram Raj College under my guidance for the partial fulfillment of the M.Sc. 4th Semester Examination, 2022, under Vidyasagar University. The work has not been published or presented for any purpose according to my knowledge.

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I acknowledge my indebtedness to Dr. Debnarayan Roy, Principal of Jhargram Raj College for giving me the scope to present this project.

I am equally thankful to Dr. Rahul Kumar Datta, Associate Professor and Head, Department of Zoology, Jhargram Raj College for the encouragement.

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We have avail the facility provided by the DBT- STAR Scheme, 2019-2022, Department of Biotechnology, Govt. of India.

CONTENT

Effect Of Climate Change On Honeybees And Potential Impact On Pollination Services

ABSTRACT

Pollination is an emergent part in plant reproduction and a key ecosystem service to animal welfare. In alliance with many other pollinator, honey bees play an important role in maintaining biodiversity by pollinating 73 percent of world's cultivated crops. Climate change is potentially most severe threat to honey bee distribution, behavior, biology because they are ectothermic in nature. Obliquely, elevated temperature affects bee through their floral resources and natural enemies. The potential disruption of a ubiquitous mutualistic interaction, that between plants and their animal pollinators, via climate change is at risk. Asynchrony may affect both plant and pollinator, by reduced insect visitation and pollen deposition, while honey bees experience reduced food availability. The "pollination crisis" that is due to declines of honey bees and native bees worldwide, caused disruption of critical balance between the two mutually interacting organisms. Here, by involving in a project to realize the impact of climate change on plant-pollinator interactions, highlighting gaps in current knowledge and future research needs.

Conclusion

Honey bees and other pollinators are critically important to securing the nation's food supply and providing ecosystem services that insure plant biodiversity, soil stability and species richness. The climate change have altered the synchrony between flowering plants and their pollinators, causing nutritional stress. Though concern have been raised about the potential negative effect of climate change. There is paucity of scientific literature on how exactly pollinators are going to be affected, especially in crop plants. There is a lack of knowledge on temperature sensitivity of crop plants and their pollinators especially in the tropics where the biodiversity of entomophilous crops is expected to be highest. Widespread mortality in the *Apis mellifera* honey bee worldwide aptly demonstrates the fragility of this species, who has shown great adaptive ability in hostile environment in highly diverse climates almost everywhere in the world by using its genetic variability (Cornuet and Louveaux,1981). These phenomenon occur due to pesticide use, new disease, and combination of these factors. But Asian species have remained in Asia due to their lesser adaptability to different environment and fragility in the face of climate change. We need researches in order to solve the environmental problems related to climate change that directly affect the life of bees, which are most vital for ecosystem. Humans are responsible for preventing and protecting all species of honey bees from extinction. So, we should more studies to enhance our knowledge on the basic ecology of crop pollination under climate change.

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JHARGRAM RAJ COLLEGE

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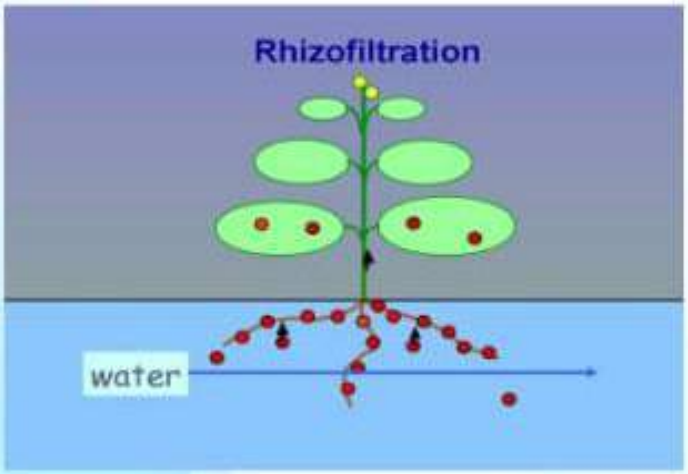
Dissertation on

Mercury Toxicity And Its Effects On Bellamya bengalensis And Phyto-Remediatioal Potential Of Aquatic Macrophytes.



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Mercury Toxicity And Its Effects on *Bellamya bengalensis* And Phyto Remediation Potential Of Aquatic Macrophytes

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Declaration OF Student

I do hereby declare that the present Dissertation entitled **" Mercury Toxicity And Its Effects on *Bellamya bengalensis* And Phyto-remediation potential Of Aquatic Macrophytes"** has been carried out by me in the Department of Zoology, Jhargram Raj College, Jhargram, under the guidance of Shri Sourav Barai , Assistant Professor Of Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

Pratima Maity

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To whom it may concern

This is to certify that the Dissertation work entitiled "**Mercury Toxicity And It's Effects On *Bellamya bengalensis* And Phyto-remediational Potential Of Aquatic Macrophytes**"has been carried out by Pratima Maity student of M.Sc. (Semester IV), Department of Zoology, Jhagram Raj College under my guidance for the partial fulfillment of the M.Sc. 4th Semester Examination, 2022, under Vidyasagar University. The work has not been published or presented for any purpose according to my knowledge.

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Acknowledgement

I acknowledge my indebtedness to Dr.Debnarayan Roy, Principal of Jhargram Raj College for giving me the scope to present this review.

I am equally thankful to Dr.Rahul Kumar Datta, Associate Professor & Head, Department of Zoology, Jhargram Raj College for the encouragement.

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It is great pleasure to express my thanks to all my departmental teachers namely Dr. Krishnendu Sinha (Assistant Professor), Dr. Koushik Sen (Assistant Professor), Shri Sourav Barai (Assistant Professor), Md. Shariful Islam (Assistant Professor), Smt. Sanchita Pan (SACT) for necessary helps as and when required.

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We have avail the facility provided by the DBT-STAR, scheme 2019-2022 Department of Biotechnology, Government of India.

Contents

“Mercury Toxicity And It's Effects On *Bellamya bengalensis* And Possible Phyto-remediational potential Of Aquatic Macrophytes"

Abstract

The short term acute exposure of Mercuric chloride (HgCl2) on fresh water snail Special reference to *Bellamya bengalensis* sequentially observed. In This Experiment,The different types of behavioural changes like mucus secretion, protective response to external stimuli, tentacular movements etc. was recorded.That's helps us to analyse , how Mercuric chloride alter physiological or behavioural responses of freshwater snail *Bellamya bengalensis.* From these observations ,we get an idea about the effects of heavy metal contamination on aquatic organisms and the bioaccumulation of these heavy metals from lower trophic levels to higher trophic levels through food chain.And attempt a review on heavy metals Phyto-remediational potential Of Aquatic Macrophytes. From this review, gained knowledge about how aquatic macrophytes can efficiently remove chemical contaminants including heavy metals from Environment

Keywords: Heavy Metals, *Bellamya bengalensis*, Mercuric chloride, Behavioural changes, Phyto-remediation, Macrophytes

Conclusion

The observed results clearly indicated that, the significant concentration of Mercury choride alter the behaviour of model organism *Bellamya bengalensis.* Bellamya acts as potent bio-indicator bio- monitor of environmental mercury pollution in aquatic ecosystems. They provide information about environmental health risk assessment that information helps us to make earlier dicision as well as good step to protect ourselves and also our biodiversity. Macrophytes play a highly active role in the clean up of heavy metals from contaminanted site. Grow Macrophytes on polluted area can help avoid metals leaching and runoff. It's possible to remediate a wide range of environmental pollutants.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

A PROJECT WORK ON

EFFECT OF MICROPLASTIC POLLUTION ON HUMAN HEALTH

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ROLL- PG/VUJGG21/ZOO-IVS NO- 005

REG NO- 1550080 OF 2017-2018

SESSION: 2020-2022

EFFECT OF MICROPLASTIC POLLUTION ON HUMAN HEALTH

Submitted by:

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The Project is submitted for the partial fulfilment of M.Sc. degree in Zoology, Vidyasagar University

2022

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We have availed the facility provided by the DBT-STAR scheme, 2019-2022
Department of Biotechnology. Government of India.

CONTENTS

1. Abstract:

Microplastic pollution is an emerging global environmental threat that affecting multiple spheres and occupying organisms. Microplastics are released into the environment undergo aging and interact with other substances such as organic contaminants and causes pollution. Microplastics enter and exit human body and translocate to and from some internal organs. Human exposure to microplastics can occur through ingestion, inhalation and dermal contact due to their presence in food, water, air and consumer products. Microplastic effects on respiratory, hepatic, immune and gastrointestinal systems. Its exposure can cause toxicity through oxidative stress, inflammatory lesions, increased uptake or translocation. The potentiality of metabolic disturbances increases neurotoxicity and cancer in humans. Microplastic pollution and its harmful impacts on environment are reduced by applying 4R strategies, i.e. reduce, reuse, recycle, and refuse. Plastic recycling is a legal requirement and can yield environmental benefits.

8. Conclusion and Future perspectives

In 21st century plastics are the most important particles as they are used practically everywhere and influence our daily lives in many ways. At the same time, it is one of the largest sources of environmental pollution. Plastic's intrinsic toxicity, chemical composition, ability to absorb and concentrate causes adverse effect. Plastic degradation causes formation of microplastics and has adverse effects on aquatic system, can overcome the intestine tissue in aquatic species and therefore possibly end up in the human food chain. Polystyrene nanoparticles are taken up and induce oxidative stress or pro-inflammatory responses in human. However, knowledge on the effects of environmental exposure to microplastics on human health is limited; more studies are needed to fully understand the risk of microplastics to human health, requiring knowledge on human exposure, pathogenesis and effects.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

Project on

An Insight in Worldwide Snow Leopards Conservation

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An Insight in Worldwide Snow Leopards Conservation

Submitted by

Sampa Patra

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I do hereby declare that the present Project entitled **"An Insight in Worldwide Snow Leopards Consrevation"** has been carried out by me in the Department of Zoology, Jhargram Raj College, Jhargram, under the guidance of Dr. Krishnendu Sinha (Assistant Professor), Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any university, and not has been published earlier anywhere.

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We have avoid the facility provided by DBT STAR Scheme 2019-2022,
Department of Biotechnology,Govt. Of India.

An Insight in Worldwide Snow Leopards Conservation

ABSTRACT

Snow leopards are one of the most elusive species in the world. The species still survives in 12 countries, with a lack of reliable data on its distribution and habitat suitability, thus hindering effective conservation planning for the species. This species can be saved from extinction if the threat of snow leopard is overcome by immediate action. Pantherauncia lives throughout the high-alpine regions of Central Asia, with most of their habitat in China. They have been listed as Endangered since 1996, under the Conservation Monitoring centre of the International Union for Conservation of Nature (IUCN). Since 1975, all international trade has been prohibited after listing in the Convention on International Trade in Endangered Species of Fauna and Flora (CITES). The International Snow Leopard Trust and the Snow Leopard Survival Strategy are promoting conservation through scientifically based research. Regional conservation programs depend not only on effective enforcement of protection laws, but also on evidence that wildlife conservation can provide new opportunities for local people affected by these species. To save this species, these areas need to be conserved and managed and rural communities need to be educated and supported.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

PROJECT ON –

LEPIDOPTERAN PESTS OF TOMATO PLANTS: BIOLOGY ,DAMAGE & MANAGEMENT

Paper Code : ZOO 496 B

ROLL - PG / VUJGG21/ZOO-IVS No-007

REG.NO.- 1450073 OF 2017 -2018

SESSION - 2020-2022

Submitted by-

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Roll:- PG/VUJGG21/ZOO-IVS No:- 007

REG . No :- 1450073 OF 2017 -2018

Department of Zoology

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Under the guidance of –

Md. Shariful Islam (Assistant prof.)

The project is submitted for the partial fulfilment of M.Sc. degree in Zoology, Vidyasagar University 2022

Declearation by student

I do hereby declare that the present Project entitled " **Lepidopteran pests of tomato plants : biology , damage & management** " has been carried out by me in the Department of Zoology, Jhargram Raj College, Jhargram, under the guidance of **Md.Shariful Islam (Assistant Prof.)** Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

Shrabani Mondal

Date - 26/08/2022

signature by student

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To whom it may concern

This is to certify that the project work entitled **"Lepidopteran pests of tomato plants: biology, damage & management"** has been carried out by **Shraboni Mondal** student of M.Sc. (Semester IV), Department of Zoology, Jhargram Raj College under my guidance for the partial fulfillment of the M.Sc. 4th Semester Examination, 2022, under Vidyasagar University. The work has not been published or presented for any purpose according to my knowledge.

Md Shariful Islam

26/08/2022

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I am equally thankful to Dr.Rahul Kumar Datta, Associate Professor & Head, Department of Zoology, Jhargram Raj College for the encouragement.

I pay my great regards, sincere gratitude and gratefulness to MD Shariful Islam, Assistant Professor of Zoology Jhargram Raj College for helpful suggestions and inspiration during the tenure of study as well as preparing this work. The presentation of the seminar and this review has been possible for me for his guidance.

It is great pleasure to express my thanks to all my departmental teachers name Sourav Barai Assistant Professor for necessary helps as and when required.

I would like to thanks all of my friends who help me in various ways to carry out my review work successfully.

It is impossible for me to work without the benevolence and blessing of my parents who always supported me in achieving my goals.

We have availed the facility provided the DBT- STAR scheme 2019 -2022 Department Of Biotechnology Govt of India.

CONTENT

ABSTRACT :-

Tomato (Solanum lycopersicum) is one of the most economic important vegetable crop in the world .Tomato has high nutritional component i.e. niacin riboflavin, iron, sodium potassium etc. Tomato belongs to the family solanaceae which are known to have a large positive impact on human health . Tomato is a host for a diverse array of lepidopterans Pests . Tomato are as popular with Lepidopterans pest and disease . Lepidopterans pest most harmful for vegetation . It is the major pest in agriculture. Lepidoptera is anorder of insects . Some report estimate that there have been over all 80,000 Lepidopterans Pests of several different taxa feeding on tomato leaves and fruit . Here , I have discussed some major problematic lepidopterans pest and their management strategies.

CONCLUSIOION :-

The lepidopteran pest complex presents various challenges for tomato growers worldwide. Globally, losses from insect pests, weeds, and diseases average 35% of potential crop yields for five major crops . The effort to development more sustainable management programs for these pests has been impeded, primarily because this crop has a low tolerance for insect damage and effective insecticides available . There is a need of an integrated approach in wake of the arising concern for the interest of human safety, environmental protection, and sustainability and incidence of increased resistance. Such approaches result into high yields and increase the profit. For sustainable vegetable cultivation, growers should include multiple strategies that work effectively together and can be applied over wide geographic areas. The new approach should address concerns of the resistance, biological controls and wise use of insecticides. Use of IPM techniques for control of Lepidopteran insects pests of resistant variety and trap cropping. of Bio-pesticides or microbial pesticides viz., Ha- NPV, Sl-NPV, Aa -NPV against lepidopteron insects pests. Use of safer insecticides for control of Lepidopteran insects pests of tomato plants . The socioeconomic impact of this Lepidopterans pest (moth) on subsistent agriculture need to be addressed in future studies.

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Jhargram Raj College

(Affiliated under Vidyasagar University)

A Dissertation on,

COMPARATIVE STUDIES OF PHYSICOCHEMICAL PARAMETERS OF THREE PONDS AT GIDHNI, JHARGRAM, WEST BANGAL

Paper Code : ZOO 496B

Roll :PG/VUJGG21/ZOO-IVS No. 008

Reg No: 1190152 of 2017-2018

Session 2020-2022

COMPARATIVE STUDY OF PHYSICOCHEMICAL PARAMETERS OF THREE PONDS AT GIDHNI, JHASRGRAM, WEST BANGAL

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Declaration

1. I understand what plagiarism emails and am aware of the University/Institute policy in this regard.

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3. I did not make use of another student's previous work and submitted it as my own.

4. I did not allow and will not allow anyone to copy my work with the intention of presenting it as his or her own work.

Countersigned

RCt.
Signature of Supervisor/Supervisors

Shreya Sanda
Signature of Student

Date: 26/8/2022

Declaration by student

I do hereby declare that the present Project/Dissertation entitled "**Comparative Studies of Physicochemical Parameters of Three Ponds at Gidhni, Jhargram, West Bengal,**" has been carried out by me in the Department of Zoology, Jhargram Raj College, Jhargram, under the guidance of Dr. Rahul Kumar Dutta and Sri. Sandip Sarkar, Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

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To whom it may concern

This is to certify that the Dissertation work entitled " Comparative Studies of Physicochemical Parameters of Three Ponds at Gidhni, Jhargram, West Bangal," has been carried out by Shreya Sanda student of M.Sc. (Semester IV), Department of Zoology, Jhargram Raj College under my/our guidance for the partial fulfillment of the M.Sc. 4th Semester Examination, 2022, under Vidyasagar University. The work has not been published or presented for any purpose according to my/our knowledge.

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PREFACE

Subject related project or dissertation is an important part in Post Graduate courses. A successful project is not just discussing what others have written on the subject but discusses about its innovativeness. With the above objective, and attempt has been done to focus on **"Comparative Studies of Physicochemical Parameters of Three Ponds at Gidhni, Jhargram, West Bengal." –** a topic of interest of many ecologists and other scientists in recent past.

ACKNOWLEDGEMENT

I acknowledge my indebtedness to **Dr. Debnarayan Roy**, Principal of **Jhargram Raj College** for giving me the scope to present this review.

I am equally thankful to **Dr.Rahul Kumar Datta**, Associate Professor & Head, Department of Zoology, Jhargram Raj College for the encouragement.

I pay my great regards, sincere gratitude and gratefulness to **Dr. Rahul Kumar Datta** Associate Professor & Head, Department of Zoology and **Sri. Sandip Sarkar** Assistant Professor & Head, Department of Mathematics Jhargram Raj College for helpful suggestions and inspiration during the tenure of study as well as preparing this work. The presentation of the seminar and this review has been possible for me for his/her guidance.

It is great pleasure to express my thanks to all my departmental teachers namely Dr. Krishnendusinha (Assistant Professor), Dr. Koushik Sen (Assistant Professor), Shri Sourav Barai (Assistant Professor), Md. Shariful Islum(Assistant Professor), Smt. Sanchita Pan(SACT) for necessary helps as and when required.

I would like to thanks all of my friends who help me in various ways to carry out my review work successfully.

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We have avail the facility provided by the DBT STAR Scheme.2019-2022

Department of Biotechnology, Govt. of India

ABSTRACT

Study of physicochemical parameters helps to determine the suitability of pond water for fish and human-being to use. This include a study of physicochemical parameter for 3 month, March to May 2022, in 3 selective ponds at Gidhni. The physicochemical parameters help to assess the quality of pond water at Gidhni, Jhargram district, West Bangal, are pH, temperature, dissolved oxygen(DO), free Carbon dioxide(CO_2), alkalinity, salinity(chloride).The results were calculated and compared with WHO and BIS water quality standards. From the data obtained, the Water Quality Index(WQI), (NSF WQI, 1970) was calculated to quantify overall pond water quality status of the area. It is found that based on results the samples are falling under excellent to good water category.

The results are statistically analyzed with Analysis of Variance (ANOVA). The correlation analysis also performed on measured parameters to determine the relationship between the variables. The one way ANOVA applied to estimate the uncertainty in measured value.

The statistical analysis of pH, temperature, dissolved oxygen, free carbon dioxide, alkalinity and salinity, temperature shows negative correlation with free CO_2, alkalinity and salinity, pH also shows negative correlation with DO, free CO_2 and alkalinity. Other parameters shows positive correlation between them. One-way ANOVA of these parameters shows highly significance at the level of 95% confidence. As all of them range between 0.008- 3.59 which are lies in the F critical value 3.885294. The BIS and WHO parameter range shows good moderate and polluted water sample of POND 1, POND 2 and POND 3 consecutively.

KEYWORDS : physico-chemical parameters, pond water, water quality, water quality index(WQI), analysis of variance(ANOVA), correlation.

CONCLUSION

POND 1 : The result for the physicochemical analysis of water sample from POND 1 indicate that the pond has good water quality with, WQI 18.96, water standard of BIS 1991(IS: 10500), shows this particular pond have 7.4 pH, 5.89mg/ L DO, 4.63 mg/L free CO_2. 30.26 mg/L alkalinity and 23.36 mg/ L of salinity at the temperature of 27.36°C. Which indicate a good water quality.

From the physico chemical analysis we can see that, POND 1 have good water quality. POND 1 shows 18.26 WQI from the calculation of water quality index(WQI). So, we can conclude sample water contain favourable water quality for domestic use.

POND 2 : Analysis of physicochemical parameters of POND 2 also shows pleasant water quality having 21.44 WQI, with comparison of BSI , standard water quality. We can see that it has 7.6 pH, 6.35 mg/L DO, 5.31 mg/L of free CO_2, 34.72 mg/L of alkalinity and salinity41.31 mg/L with the temperature of 27.34°C. Which proves that it has a good water quality.

From the physicochemical analysis of these parameters, we can see that POND 2 is basically in balanced condition with 21.44WQI by analysing water quality index(WQI). which conclude that the Pond 2 has suitable water quality for domestic use.

POND 3 : From the physico- chemical parameters of POND 3 also shows good water quality having 28.56 WQI, with comparison of BIS standard water quality we can see that it has pH 8, 6.4 mg/L DO, 7.68 mg/L free CO_2, alkalinity 33.46mg/L and salinity 45.42 mg/L with the temperature of 27.06°C. Which indicate that it has a moderate water quality.

From, the physicochemical analysis of these parameter we can see that, Dissolved oxygen(DO) level is moderate but CO_2 level was observed to be high due to pollution effect. Pond 3 shows 28.46 WQI by analysing water quality index(WQI),which indicate it has good water quality for domestic and other activities of villagers.

From all the analysis we can conclude that, water sample of POND 3 is slightly polluted than the water samples of POND 1 and POND 2. For the assessment of pond water quality at Gidhni , water sample have been collected from three ponds, for assessing the suitability of pond water of domestic use , the water quality data of the analyzed samples were compared with the prescribed water standards of BIS[6] and have been considered for the calculation of WQI[22]. The water quality ranges from 18.96 to 28.46 indicating excellent to good water quality in the study area. Which conclude that Pond 1,2 and 3 are totally safe to use of domestic purpose and other activities of villagers.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

Dissertation work on

Usage Pattern & Impact of Agricultural Chemicals on Human Health in Village Khanchi, Purba Medinipur.

Paper code: ZOO 496B

Roll: PG/VUJGG21/ZOO-IVS No: 009

Registration No- 1550109 of 2017-2018

Session: 2020-2022

A DISSERTATION WORK ON

Usage Pattern and Impact of Agricultural Pesticides on Human Health in village khanchi, Purba Medinipur.

Submitted by- Soma Guria

Guided by

Mr. Sourav Barai

Assistant professor

Zoology Department

Jhargram Raj College

This project work has been presented for the partial fulfillment of M.Sc. 4th Semester Examination, 2022 [PAPER ZOO496B] under Vidyasagar University

DECLARATION

I do hereby declare that the present dissertation entitled **"Usage pattern and impact of agricultural chemicals on human health in village khanchi, Purba Medinipur"** has been carried out by me in the department of zoology, Jhargram Raj College, Jhargram, under the guidance of Sourav Barai sir Jhargram Raj College and no part thereof been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

Soma Guria
.....

5

Post Graduate Department of Zoology
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To whom it may concern

This is to certify that the Dissertation work entitled **"Usage Pattern and Impact of Agricultureal Chemicals on Human Health in Village Khanchi, Purba Medini Pur** "has been carried out by Soma Guria student of M.Sc. (Semester IV), Depatment of Zoology, Jhargram Raj College under my guidance for the partial fulfillment of the M.Sc. 4th Semester Examination, 2022, under Vidyasagar University. The work has not been published or presented for any purpose according to my knowledge.

Date: 26/08/22

Sourav Barai
(Signature)

PREFACE

For the partial fulfillment of our special paper syllabus of M.Sc SEM-lV (ZOOLOGY) examination,2022 under Vidyasagar University an project work undertaken by department of zoology, Jhargram Raj College. A project is a piece of planned work or an activity that is finished a period of time and intended to achieve a particular purpose. The word ‘project’ comes from the Latin word ‘project’ from Latin verb mean ' before an action '. Mostly it comprises the opinion of expert collected data from field. With the above objective and attempt has been done on topic “ **Usage pattern and impact of pesticides on human health in village khanchi, Purba Medinipur “.**

ACKNOWLEDGEMENT

I, **Soma Guria** would like to take opportunity to express my deep sense of gratitude to all those people without whom this work would have never been completed.

I would pay my sincere gratitude to **Dr. Debnarayan Roy,** principal of Jhargram Raj College for given me the scope to present and continuously encourage for preparing my work.

I extend my gratitude and also give thanks to **Mr. Sourav Barai,** assistant professor, department of zoology, Jhargram Raj College, for his constant guidance and encouragement and also inspiring for preparing my work.

It is great pleasure to express my thanks to all departmental teachers namely Dr. Krishnendu sinha(assistant professor), Dr. Koushik sen(Assistant professor), Md. Shariful Islam (assistant professor), Smt. Sanchita Pan (SACT) for necessary helps as and when required.

I am also grateful and thankful to all of my friends who help me in various ways to complete my work successfully.

I express warmest gratitude to those local people whose continuous help giving me different information honestly.

It is impossible for me to work with out the benevolence and bletof my father who always support me in achieving my goals.

We have availed the facility provided by the DBT-STAR scheme. 2019-2022 Department of Biotechnology, Govt. of India.

CONTENT

USAGE PATTERN AND IMPACT OF AGRICULTURAL CHEMICALS ON HUMAN HEALTH IN VILLAGE KHANCHI, PURBA MEDINIPUR

Abstract:

In Indian population a vast majority of people are engaged in agriculture. So they also directly linked with pesticides. Majority of them have no appropriate knowledge about the right way to use of pesticides. The inappropriate pesticide storage and inadequate protective measures frequently cause of pesticide exposures of farmers. The present study was made to evaluate the acute toxic effect of pesticides on human health as well as the other animals and how to overcome from these problems. This study was conducted with the farmers of khanchi in Purba Medinipur district of West Bengal to identify the risk and hazards of pesticide. It is a questionnaire based study. This study suggests that the farmers of khanchi were badly affected by pesticides due to lack of sufficient protection, so by this project work I want to guide farmers about the health hazards of pesticide and how to overcome from these problems.

Conclusion:

At the end of this study we conclude that the main cause of pesticides exposure is lack of knowledge or the farmers have no enough money for buying personal protective measures for handling pesticides. In that case it must be important that our government should take few initiatives for availability of this protective kids. It very much needed that the governmental or non governmental organization and international agencies have been working together to organize training, which help farmers to learn about right way to use of pesticides and encourage them to use of bio pesticides. This type of training are urgently needed in India for good health care. In a very short time I had to work with in one village khanchi , with few farmers . In further this work will done along with 3-4 village with more information. My data collection shows the external

symptoms, it can not covered the internal chronic effect of pesticides. In future same type of work will be done with more data.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

PROJECT ON

BLUE CARBON AND ITS IMPACT ON ENVIRONMENT


Paper Code : ZOO 496B

Roll : PG/VUJGG21/ZOO-IVS No:010

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BLUE CARBON AND ITS IMPACT ON ENVIRONMENT

Submitted by

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This Project is submitted for the partial fulfilment of M.Sc. degree in Zoology, Vidyasagar University

2022

DECLARATION BY STUDENT

I do hereby declare that the present Project entitled " **Blue Carbon and Its Impact On Environment** " has been carried out by me in the Department of Zoology, Jhargram Raj College,Jhargram, under the guidance of Mr. Sanjib Kumar Das, Assistant Professor of Zoology, Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

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24.08.2022

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To whom it may concern

This is to certify that the project work entitled **"Blue Carbon And Its Impact On Environment."** has been carried out by Tanushree Pramanik, student of M.Sc. (Semester IV), Department of Zoology, Jhargram Raj College under my guidance for the partial fulfillment of the M.Sc. 4th Semester Examination, 2022, under Vidyasagar University. The work has not been published or presented for any purpose according to my knowledge.

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I am equally thankful to Dr.Rahul Kumar Datta, Associate Professor & Head, Department of Zoology, Jhargram Raj College for the encouragement.

I pay my great regards, sincere gratitude and gratefulness to Mr. Sanjib Kumar Das, Assistant Professor of Zoology, Jhargram Raj College for helpful suggestions and inspiration during the tenure of study as well as preparing this work. The presentation of the seminar and this review has been possible for me for his guidance.

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It is impossible for me to work without the benevolence and blessing of my parents who always supported me in achieving my goals.

We have Availed the facility provided by the DBT-STAR Scheme 2019-2022 , Department of Biotechnology, Govt. of India.

CONTENT

BLUE CARBON AND ITS IMPACT ON ENVIRONMENT

Tanushree Pramanik

ABSTRACT

Blue carbon is a term coined a decade ago that is related to the terms such as marine and coastal ecosystem degradation and also their conservation and restoration with climate change mitigation and some other adaptations related to the ecosystems. Fixation of carbon is occurred by vegetated coastal ecosystems (i.e. blue carbon) that mitigates greenhouse gas emissions. The most efficient natural carbon sinks are the blue carbon ecosystems. Blue carbon plays a role for countries with moderate fossil fuel emissions and extensive coastlines. In 2014, mitigation has occurred by mangroves greater than 1% of national fossil fuel emissions for countries such as Bangladesh(top 45^{th} fossil fuel emitter),Colombia(43^{rd}),and Nigeria (40^{th}).Some coastal ecosystems such as mangroves, tidal marshes, seagrass having high amount of carbon stock, establishes blue carbon ecoststems and supports long-term carbon storage. However, nowadays blue carbon is a very interesting topic in research field of science.

Keywords: Blue carbon, vegetated coastal ecosystem, greenhouse gas emissions.

CONCLUSION

The concept of blue carbon is multifaceted and an international attention is received by it for its potential role in mitigating CO_2 emissions. As blue carbon ecosystem contributes a wide range of benefits for conservation of coastal wetlands and gives all potential opportunities for climate change mitigation and adaptation in marine ecosystems. So, blue carbon ecosystem conservation will maintain carbon sequestration into the future and present emissions from land use change.

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JHARGRAM RAJ COLLEGE

(AFFILIATED TO VIDYASAGAR UNIVERSITY)

DISSERTATION WORK ON

STUDIES ON INFESTATION OF RUGOSE SPIRALLING WHITEFLY AT DIFFERENT FIELDS IN ADJOINING AREA OF NANDIGRAM IN PURBA MEDINIPUR, WEST BENGAL

PAPER CODE: ZOO496B

ROLL: PG/VUJGG21/ZOO-1VS NO: 012

REG. NO: 1490006 OF 2017-2018

SESSION: 2020-2022

A Dissertation Work on

Studies on infestation of Rugose spiralling whitefly at different fields in adjoining area of Nandigram in Purba Medinipur, West Bengal

Submitted by

Anupam Mondal

Roll- PG/VUJGG21/ZOO-IVS, No- 012

Reg. No- 1490006 of 2017-2018

Jhargram Raj College

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This project work has been presented for the partial fulfillment of M.Sc. 4th Semester Examination, 2022 [PAPER ZOO496B] under Vidyasagar University

Declaration by student

I do hereby declare that the present Dissertation entitled **"Studies on infestation of Rugose spiralling whitefly at different fields in adjoining area of Nandigram in Purba Medinipur, West Bengal"** has been carried out by me in the Department of Zoology, Harrah Raj College, Jhargram, under the guidance of Dr. Rahul Kumar Datta, Associate professor and Head of the Department of Zoology, Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

Anupam Mondal
24.08.2022.

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TO WHOM IT MAY CONCERN

This is to certify that the Dissertation work entitled **"Studies on infestation of Rugose spiralling whitefly at different fields in adjoining area of Nandigram in Purba Medinipur, West Bengal"** has been carried out by Anupam Mondal (Roll- PG/VUJGG21/ZOO-IVS No- 012, Registration No- 1490006 Of 2017 - 2018), a student of M.Sc. 4th Semester, Dept. of Zoology, Jhargram Raj College. He has submitted this work for the purpose of partial fulfillment of M.Sc. 4th Semester Examination, 2022, in Zoology, under Vidyasagar University under my guidance. I am forwarding this for the submission for the above mentioned examination. This has not been published or presented before for any purpose according to my knowledge. I wish him success in life.

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I acknowledge my indebtedness to Dr. Debnarayan Roy, Principal, Jhargram Raj College for giving me the scope to present this project.

I pay my sincere gratitude and regards to Dr. Rahul Kumar Datta, Associate professor and Head of the Department of Zoology, Jhargram Raj College for helpful suggestions and inspiration during the tenure of study as well as preparing this work.

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ABSTRACT

Rugose spiralling whitefly (RSW) *Aleurodicus rugioperculatus* Martin (Hemiptera : Sternorrhyncha : Aleyrodidae) is a polyphagous pest in India infesting coconut, banana, mango, guava and many others plants, including some ornamental plants and many horticulture crops. The pest is originated from Belize (Central America) and entered India accidentally in 2016 in Tamil Nadu and Kerala on coconut and banana plants and now a days the pest found in many agricultural states in India. This insect feeds by sucking the nutrients and water of host plant and excretes a sticky sugary liquid substance called honeydew, which helps to grow the black fungi called sooty mold. During the study the pest was identified with their host plant and nature of damage were recorded in four different fields of Purba Medinipur, West Bengal. At present, this animal is considered as invasive species and a strong sucking pest in India. Its cause of increased condition is also discussed.

Conclusion

The invasive pest rugose spiralling whitefly is well established now on coconut, banana and others plants and crops in West Bengal and that is more harmful threat to their host with damage of biodiversity and agro- ecology direct or indirectly. This whitefly established in future as one of the most sever threatening pest on agricultural crops, if not managed and controlled properly. This sucking pest may be managed by many cultural, biological and chemical methods. But it should be kept in mind that this controling methods, measures specially the chemicals should not create any bad effects on our nature. Whereas this pest is most harmful on the plants and crops, so we have to try to measure and control the economic damage by this pest. So regular monitoring and survey on this pest infected area are most important for the prevent and control of this pest population, and try to acquaint to farmers about this pest with management and control and try to acquaint to farmers and local people to alert and control the global warming. If it possible, the farmer must will be benefited economically and environmentally.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

A PROJECT WORK ON

AIR POLLUTION IMPACT ON NEURAL DEVELOPMENT

PAPER: ZOO496B

ROLL- PG/VUJGG21/ZOO-IVS NO- 013

REG NO- 1290020 OF 2017-2018

SESSION: 2020-2022

Air pollution impact on neural development

Submitted by:

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29.08.2022.

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I acknowledge my indebtedness to Dr. Debnarayan Roy, Principal of Jhargram Raj College for giving me the scope to present this dissertation.

I am equally thankful to Dr. Rahul Kumar Datta, Associate Professor & Head, Department of Zoology, Jhargram Raj College for the encouragement.

I pay my great regards, sincere gratitude and gratefulness to, Dr. Koushik Sen Assistant Professor, Department of Zoology, Jhargram Raj College for helpful suggestions and inspiration during the tenure of study as well as preparing this work. The presentation of the seminar and this dissertation has been possible for me for his guidance.

It is great pleasure to express my thanks to all my departmental teachers namely Dr. Krishnendu Sinha (Assistant Professor), Shri. Sanjib Kumar Das (Assistant Professor), Shri. Sourav Barai (Assistant Professor), Md. Shariful Islam (Assistant Professor), Smt. Sanchita Pan (SACT) for necessary helps as and when required.

I would like to thank all of my friends who help me in various ways to carry out my dissertation work successfully.

It is impossible for me to work without the benevolence and blessing of my parents who always supported me in achieving my goals

We have availed the facilities provided by the DBT-STAR scheme, 2019-2020

Department of Biotechnology .Govt. of India

CONTENTS

Air Pollution impact on neural development

Abstract:

Air pollutionis a major issue in public health as epidemiological studies have highlighted its numerous harmful of health such as respiratory and cardiovascular, neurological pathological conditions. Exposureto ambient air pollution is a serious and common public health concern associated with increasing morbidity and mortality worldwide.

In the recent past, air pollution hasbeen associated with diseases of the central nervous system (CNS), including stroke, Alzheimer's disease, Parkinson's disease, and neurodevelopmental disorders.It has been demonstrated that various components of air pollution, such as nano sized particles, can easily translocate to the CNS where they can activate innate immune responses.

Emerging evidence suggests that air pollution-induced neuroinflammation, oxidative stress, microglial activation, cerebrovascular dysfunction, and alterations in the blood-brain barrier contribute to CNS pathology.A better understanding of the mediators and mechanisms will enable the development of new strategies to protect individuals at risk and to reduce detrimental effects of air pollution on the nervous system and mental health.

Conclusions and Future Prospects:

Air pollutants have been, and continue to be, major contributing factors to chronic diseases and mortality, thereby dramatically impacting public health. Air pollution is a global problem and has become one of the major issues of public health as well as climate and environmental protection. An increasing number of people are exposed to a complex mixture of inhalable NPs and toxic chemicals occupationally or as a result of manmade and natural disasters, such as war, firesand volcanic eruption.Air pollution is increasingly recognized as an important and modifiable determinant of cardiovascular and respiratory diseases in urban communities.

Although adverse cardiopulmonary outcomes have been the focus of many studies, air pollution related damage to the CNS has been widely neglected. There is evidence that air pollution also contributes to CNS damage or increased progression of neurodegenerative disorders. Traffic-derived pollution, causes CNS damage and that there is a clear link between air pollution and neurological diseases. Airborne particles cause neuropathology, which seem to be mediated by direct or indirect proinflammatory and oxidative responses. Both, the physical characteristics of the particle itself and toxic compounds adsorbed on the particle may be responsible for the damage.

Minimum doses of pollution can be handled by the organism when this exposure is acute, but the same doses administered chronically lead to an oxidative stress state that can produce neurodegeneration. Astroglia, cerebral endothelial cells, and microglia in particular respond to components of air pollution with chronic activation, inflammation, and oxidative stress.

CNS effects can be chronic, can begin in early childhood, and may accumulate with age. The main problems that are encountered in testing air pollutants toxicity in humans are dosimetry, the lack of appropriate standardized protocols, and good quantitative descriptions of real-world exposure conditions.Improving air quality standards, minimizing personal exposures, and the redesign of engine and fuel technologies will also reduce air pollution and its consequences for neurological morbidity and mortality.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

Dissertation work on

"A preliminary assessment of ground water quality in and around Jhargram, West Bengal"

PAPER CODE: ZOO 496B

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REGISTRATION NO: 1020081 OF 2017-2018.

A Dissertation on

“A preliminary assessment of ground water quality in and around Jhargram, West Bengal”.

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I acknowledge my indebtedness to Dr. Debnarayan Roy, Principal of Jhargram Raj College for giving me the scope to present this review.

I am equally thankful to Dr. Rahul Kumar Datta, Associate Professor & Head, Department of Zoology, Jhargram Raj College for the encouragement.

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We have availed the facility provided by the DBT-STAR Scheme 2019-2022, Department of Biotechnology, Government of India.

A Preliminary Assessment of Ground Water Quality in and around Jhargram

A Preliminary Assessment of Ground Water Quality in and around Jhargram

Abstract: -

Decision-making in the assessment of physio-chemical quality of groundwater for drinking purposes. This assessment reports the certainty levels for the acceptability of the water based on the prescribed limit of various regulatory bodies quality class and perception of the experts from the field of drinking water quality. In this study, water samples were collected from seven (7) different areas in and around Jhargram and assessed their physio-chemical parameters.

Conclusion

From the foregoing discussion it may be concluded that the groundwater within the study area isn't good quality of water. It is-

1. Foul smelling and foaming – reason for contamination from sewage, low depth level of water causes a growth of various types of bacteria in water and those bacteria species produce the bad smell in water source.

2.Unfit for bathing and washing (as it forms no lather with soap): Most of the water samples shows hardness about 56-110 (mg/l)which could be a moderately hard water.

3 Scale forming: A Moderately level of Total hardness like minerals calcium, carbonate and bicarbonate etc.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

Dissertation on

Effect of mercury pollution on non-target organisms with reference to behavioural endpoints of *Bellamya bengalensis*.



Paper Code: ZOO 496B

Roll: PG/VUJGG21/ZOO-IVS No: 017

Registration No: 1190116 of 2017-2018

Session: 2020-2022

Effect of mercury pollution on non-target organisms with reference to behavioural endpoints of *Bellamya bengalensis.*

Submitted by
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Declaration by student

I do hereby declare that the present dissertation entitled **"Effect of mercury pollution on non-target organisms with reference to behavioural endpoints of *Bellamya bengalensis*"** has been carried out by me in the Department of Zoology, Jhargram Raj college, Jhargram, under the guidance of Shri Sourav Barai (Assistant Professor), Department of Zoology, Jhargram Raj College and no part thereof been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

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I acknowledge my indebtedness to Dr. Debnarayan Roy, Principle of Jhargram Raj College for giving me the scope to present this dissertation.

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It is impossible for me to work without the benevolence and blessing for my parents who always supported me in achieving my goals.

We have availed the facility provided by the DBT STAR Scheme, 2019-2022 Department of Biotechnology, Govt. of India.

Table of Content

Effect of mercury pollution on non-target organisms with reference to behavioural endpoints of *Bellamya bengalensis*.

Rahul Jana

Abstract:

The changes of behaviours were recorded in fresh water snail *Bellamya bengalensis*, when subjected to short term chronic exposure of mercuric chloride. The experiment was done through observed the various types of physiological changes of organism (*Bellamya bengalensis*) including tentacular movement, foot movement, response to external stimuli, clumping and crawling behaviours etc. This study helps us to determine how the toxicants or heavy metals (mercury) are effect on physiological and morphological changes of freshwater snail *Bellamya bengalensis.* Through this experiment, gained the knowledge about those how heavy metals or molluscicide effect on aquatic organisms as well as its impact on environment. This paper deals with the behavioural changes of *Bellamya bengalensis* due to effect of mercuric chloride. From this study get an idea about the effect of mercuric chloride on aquatic organism, which may further go to the human and another carnivorous animal through the process of bioaccumulation.

Keywords: *Bellamya bengalensis*, chronic, mercuric chloride, tentacular movements, clumping, crawling, toxicants, molluscicide, carnivorous, bioaccumulation.

Conclusion:

From the obtained result it can be concluded that the behavioural responses of *Bellamya bengalensis* was changed due to exposure of toxic agent mercuric chloride ($HgCl_2$) over time. Similar studies revealed that behavioural responses of the molluscan animals were changed due to presence of toxic compounds. In the presence of the toxic compounds *B. bengalensis* shown changes in behavioural responses, so they can be act as biomarkers in future biomonitoring studies. In aquatic bodies, observation of behavioural responses of molluscan animals can indicate the contaminant agent and its concentration in aquatic body.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

Dissertation on

Ethnozoological Practices Among Tribal Community in Jhargram District of West Bengal, India



Paper Code: ZOO 496B

Roll: PG/VUJGG21/ZOO-IVS No: 018

Registration No: 1190214 of 2017-2018

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Declaration by student

I do hereby declare that the present Dissertation entitled **"Ethnozoological practices among tribal community in jhargram district of West Bengal, India"** has been carried out by me in the Department of Zoology, Jhargram Raj College, Jhargram, under the guidance of Dr. Koushik Sen (Assistant Professor), Department of Zoology, Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

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I acknowledge my indebtedness to Dr. Debnarayan Roy, Principal of Jhargram Raj College for giving me the scope to present this dissertation.

I am equally thankful to Dr. Rahul Kumar Datta, Associate Professor & Head, Department of Zoology, Jhargram Raj College for the encouragement.

I pay my great regards, sincere gratitude and gratefulness to, Dr. Koushik Sen Assistant Professor, Department of Zoology, Jhargram Raj College for helpful suggestions and inspiration during the tenure of study as well as preparing this work. The presentation of the seminar and this dissertation has been possible for me for his guidance.

It is great pleasure to express my thanks to all my departmental teachers namely Dr. Krishnendu Sinha (Assistant Professor), Shri Sanjib Kumar Das (Assistant Professor), Shri Sourav Barai (Assistant Professor), Md. Shariful Islam (Assistant Professor), Smt. Sanchita Pan (SACT) for necessary helps as and when required.

I would like to thank all of my friends who help me in various ways to carry out my dissertation work successfully.

It is impossible for me to work without the benevolence and blessing of my parents who always supported me in achieving my goals.

We have availed the facility provided by the DBT - STAR Scheme, 2019 – 2022 Department of Biotechnology, Govt of India.

Table of Content

Ethnozoological Practices Among Tribal Community in Jhargram District of West Bengal, India

Rakesh Acharya

Abstract

India has a widespread floral and faunal diversity, which are played a major role in human life, mostly with the various ethnic communities; those are more depend on floral and faunal resources for their ethnomedicine, food and shelter purpose also. This paper deals with the zootherapeutic practice among various ethnic communities in Jhargram district, West Bengal, India. Extensive field surveys were conducted from October 2021 to July 2022 by performing interviews and informational conversations of non-random basis through structured questionnaire. During study period total 100 indigenous respondents (58 female and 42 male) who provide the traditional knowledge regarding different tribal medicinal uses of animal body parts and their byproducts and provide also local name of animals, method of preparation and mode of administration etc. This study has been recorded a total of 32 different animal species which are used for treatment of various disease condition. Aves and Mammals both assumed the highest number of uses (25% each), followed by Arthropods (21.87%), Reptiles (15.62%), Mollusca (6.25%), then Annelida and Amphibia both (3.12%). From collected data many species, are Least Concern, and few are Vulnerable and Near Threatened. This information assemble from this Ethnozoological study may be helpful for taking proper conservation strategies and sustainable management of faunal resources in the tribal rich area.

Key words: Ethnic Community, Ethnomedicine, Zootherapy, Traditional Knowledge, Ethnozoology

Conclusion

This study provides an Ethnozoological data about the utilization of the faunal diversity by different tribal people in long term and their effectiveness on environment. Moreover, it may provide a knowledge about the practical use of animals for medicinal purposes. Ethnozoological information collected through this study is still preliminary, so further studies are needed for integrating scientific validation to their traditional knowledge and pharmacological validation should include key factors like taxonomy, ecological role on ecosystem, conservation strategies and management of faunal resources in the tribal area is required to complete understanding of their various traditional knowledge systems.

We also observed that many animals, used for the therapeutic purpose, are threatened in nature. Therefore, initiative should be taken by the Government to run awareness programmed at routine interval for awaking those communities for the sustainable use of those animals to protect the biodiversity of this region or to stop them from hunting or poaching of animals in near future. Initiatives should also be taken to conserve this traditional knowledge of zootherapy as well as more survey work and research studies at molecular level must be conducted to reveal the active component of this ethnic medicine which could be useful for us and researchers work in the pharmaceutical field may try to produce better medicine by mimicking those active components in near future.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

Project on

Solid Waste Management and Its Current Scenario in West Bengal

Paper Code: ZOO 496B

Roll: PG/VUJGG21/ZOO-IVS No.: 019

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I acknowledge my indebtedness to Dr. Debnarayan Roy, Principal of Jhargram Raj College for giving me the scope to present this project.

I am equally thankful to Dr. Rahul Kumar Datta, Associate Professor & Head, Department of Zoology, Jhargram Raj College for the encouragement.

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We have avail the facility provided by the DBT- STAR Scheme. 2019-2022 Department of Biotechnology, Govt. of India.

CONTENT

Solid Waste Management and Its Current Scenario in West Bengal

Abstract

India has been experiencing very high population growth and urbanisation. Rapid increase in urbanisation and income causing rapid increase in waste production. Big cities are facing more challenges to manage solid waste relative to small cities. In recent times e-waste and plastic waste are increasing dramatically. Without proper management, these solid waste creates environmental as well as human health problems. Solid waste management efficiency in India is very poor relative to developed countries. Even large portion of solid waste is dumped in cities or just outside the cities, in open field without any treatment. These leads to groundwater, contamination, air pollution and soil pollution. West Bengal comes in the third place in solid waste generation throughout all over the India. Recycling various solid waste like - plastic and paper, can be helpful to minimise the waste. This study describes about current status of municipal solid waste management in different regions of India especially in West Bengal.

Conclusion

Consciously or unconsciously, human civilisation is tremendous amount of waste that consequence in health related and hazardous issues. ‘Prevention is better than cure’, here too prevention is in need before scenario changes into an uncontrollable situation and create detrimental effect on living system and environment. However this scenario can be changed by proper system of waste management and most significantly public awareness. Disposal of solid waste with conventional way is not so safe because of its noxious effects. That is why composting is a very good method since here the residual part can be further used as fertiliser. Other techniques may not as good as composting but they are also effective to minimise the solid waste volume and it’s lethal effects. These methods are good for fuel generation from solid waste. At the end, we, the citizens must have to perform fundamental duties to protect our environment.

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Jhargram Raj College

(Affiliated under Vidyasagar University)

Project on

Fish diversity analysis of three different river and Physiochemical parameters of Kangsabati river at Paschim Medinipur, West Bengal

Paper Code: ZOO 496B

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Session 2020-2022

Fish diversity analysis of three different river and Physiochemical parameters of Kangsabati river at Paschim Medinipur, West Bengal

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FISH DIVERSITY ANALYSIS OF THREE DIFFERENT RIVER AND PHYSIOCHEMICAL PARAMETERS OF KANGSABATI RIVER AT PASCHIM MEDINIPUR, WEST BENGAL

Declaration

1. I understand what plagiarism entails and am aware of the University /Institute policy in this regard.

2. I declare that this dissertation is my own, original work and free from plagiarism. Where someone else's work was used (whether from a printed source, the internet or any other sources) due acknowledgement / reference was made.

3. I did not make use of another student's previous work and submitted it as my own.

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Countersigned

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Signature of Student

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Declaration by student

I do hereby declare that the present Project entitled "Fish diversity analysis of three different river and Physiochemical parameters of Kangsabati river at Paschim Medinipur, West Bengal" has been carried out by me in the Department of Zoology, Jhargram Raj College, Jhargram, under the guidance of Shri Sourav Barai, Assistant Professor,Dept. of Zoology,Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

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Preface

Subject related project or dissertation is an important part in Post Graduate courses. A successful project is not just discussing what others have written on the subject but discusses about its innovativeness. With the above objective, and attempt has been done to focus on "Fish diversity analysis of three different river and Physiochemical parameters of Kangsabati river at Paschim Medinipur, West Bengal" – a topic of interest of many ecologists and other scientists in recent past.

Acknowledgement

I acknowledge my indebtedness to Dr.Debnarayan Roy, Principal of Jhargram Raj College for giving me the scope to present this review.

I am equally thankful to Dr.Rahul Kumar Datta, Associate Professor & Head, Department of Zoology, Jhargram Raj College for the encouragement.

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It is impossible for me to work without the benevolence and blessing of my parents who always supported me in achieving my goals.

Content

- ABSTRACT:

The present study conducted on diversity analysis of river Keleghai, Kabgsabati and Kapaleswari following through Paschim Medinipur district of West Bengal, India. and study Physiochemical parameters of Kangsabati river, at Dherua,Paschim Medinipur, West Bengal.

In this study to report the fish diversity analysis of those three rivers through Shannon-Wiener Index, Simpson's index and Margalef's index and the data of collection of fish was collected from 3 different papers. the fish data of fish collection from Keleghai river was obtain from the paper of R.P.Pahari(Pahari et. al,2017), Kangsabati river was obtain from the paper of A.Kar(Kar et.al,2017),Kapaleswari river was obtain from the paper of A.Jana(Jana et. al, 2021).

By those three-paper analysing the data it was found that Shannon-weiner index and simpson's index are respectively 2.929,3.115,3.66 and 0.1195,0.06371,0.0264. it's indicate Diverse community with stable habitat condition of river Keleghai,Kangsabati but Keleghai river water moderately contaminated and highly diverse community with stable habitat condition of river Kapaleswari. And Margalef's index of those three rivers are respectively 8.42,6.29,7.72. it indicates species richness is very high in Keleghai and Kangsabati river and relatively low in Kangsabati river.

Study physiochemical parameters of Kangsabati river where it was found that DO of water is 4.83 ± 0.33 mg/l, Free Co_2 4mg/l, Alkalinity 104 ± 1.63 mg/l, pH 7, Temperature 28^{o}c.This water condition of Kangsabati river is stable for fish diversity sustain.

- Introduction

Freshwater biodiversity constitutes a vitally important component of the planet as compared to the species richness of both terrestrial marine ecosystems (Gleick et.al.1996). It is estimated that freshwater habitats are among the world's most threatened ecosystems with about 25% of the global vertebrate diversity (Groombridge et al.1992). River represents a rich source of fish species which support the commercial fisheries. Fishes play a major role in the socio-economic development of the country, as it is a valuable resource of livelihood for a huge section of economically backward population.

The objective of the present study is to report the fish diversity analysis of the Keleghai, Kangsabati and Kapaleswari river at Paschim Medinipur, West Bengal through Shannon wiener index(H'), Simpson's index(D) and Margalef's index(R). To know Diversity,pollution and richness status of these three different river.

The data of collection of fish was collected from 3 different papers. the fish data of fish collection from Keleghai river was obtain from the paper of R.P.Pahari(Pahari et. al,2017),Kangsabati river was obtain from the paper of A.Kar(Kar et.al,2017),Kapaleswari river was obtain from the paper of A.Jana(Jana et. al, 2021).

Shannon wiener index is a popular metric used in ecology. It's based on claude Shannon formula for entropy and estimates species diversity. The Shannon index tells how diverse the species in a given community. And also give us information about water pollution. The value of the Shannon wiener diversity index range between 1.5-3.5. To evaluate of organic contamination on the demographic structure of aquatic ecosystem organisms, The classification proposed by Wilhm and dorris(1968) was used based on this classification, A Shannon wiener diversity index less than 1 represents a highly contaminated ecosystem, between 1 and 3 indicate a relatively contaminated ecosystem and more than 3 represents a non-contaminated ecosystem.

Simpson's index is one of the most popular and robust way to measure diversity in a community; as simpson's index increase, diversity decreases. Although originally proposed to measure diversity in ecological community, nowadays, we use it widely in quantifying diversity other area as well.

Margalef's index is a species richness index which compensates for the effects of sample size through dividing the number of species in a sample by the natural log of organisms collected. Margalef's index has no limit value and shows a variation depending upon the number of species.

Physiochemical parameters are also very important for fish diversity. It was needed to keep an eye on physiochemical parameters to sustain fish diversity.

- Literature Review:

The purpose of the study is to review the previous of researchers on ichthyofaunal diversity and water quality of river. The ichthyofaunal diversity is a good indicator of health of ecosystem. A good diversity represents the balanced ecosystem.

It was found total 190 fish species belonging to 62 families and 23 orders from upper Ganga to the river mouth of Hooghly estuary. The assessment of native species revealed about 10% and 14.21% of the total species are listed under the threatened status of IUCN red list 2013 (Das,B.K., et al.2021).In Damodar River the result reveals the occurrences of 46 fish species belonging to 7 orders,18 families and 26 genera, the collected species order cypriniformes constituting 38%, Perciformes 30% and Siluriformes 26% of the total fish species. And they analysis the diversity of the river through Simpson's index (Saha, M.K., et al.2013). It was studies two different season (After monsoon and Post monsoon) on Budhabalanga river odisha. They saw Shannon diversity index varied in after monsoon 3.345. and post monsoon 3.262. And as per IUCN 2010, The fish fauna of Budhabalanga river the maximum 84.09% species least concern, 9.09% data deficient, 4.55% near to threatened and 2.27% are vulnerable species (Samal,D.,et al.2016).It was studied the diversity of purilia by dividing it into five station. They found 52 Species belonging to 22 families. And Showed Cypriniformes order represent highest diversity (Mondal,K.,et al2015).It was studied Bochamari beel, a natural wetland of coochbehar district. They found 40 species of fishes belonging to 6 order 15 families. They studied different season (Pre monsoon, monsoon, and post monsoon) And showed Shannon wiener diversity index varied from different season in monsoon(H'=2.876), In Pre monsoon (H'=2.124) and Post monsoon (H'=1.735) (Das, R.K et al.2018). It was found 119 fish species belonging to 10 order, 29 families. And They showed Shannon wiener diversity index and margalef's index varied from range between 3.34 to 4.13 and 7.97 to 13.74 respectively in the river Jaldhaka,West Bengal(Sarkar, et al.2018).It was found 15 species belonging to 5 orders, and they showed instability in occurrence and abundance of the species are influence by number of pollutions viz. Industrial pollution, pollution from pesticides etc in paddy field of Haldia Block(Dayel samanta, D., et al.2020).

- Materials and method:

The river fish diversity analysis of three different river at Paschim Medinipur district, through Shannon wiener index, Simpson's index, and Margalef's richness index. The species count data are collected from different paper for Keleghai river (Pahari,R.P et al2017) for Kangsabati river(Kar,A et al.2017) for Kapaleswari river (Jana,A., et al.2021).

Diversity indices:

1.Shannon wiener index(H'):

The Shannon wiener index is calculated form the following formula:

$$H' = -\sum n_i/N * \ln(n_i/N)$$

Where N is the total population size of the species, ni is the proportion of individuals found in the species i.

2. Simpson's index(D):

The Simpson's index is calculated from the following formula:

$$D = \sum n_i * (n_i - 1)/N * (N - 1)$$

Where ni is the total number of organisms found in the species i, N is the total number of organisms of all species.

3.Margalef's index(R):

Margalef's index is calculated from the following formula:

$$R = S - 1/\ln N$$

Where S is the number of species and N is the total number of individuals in the sample.

4. For physiochemical parameter study of river Kangsabati:

It determined the dissolved free co_2, dissolved oxygen, Total alkalinity, pH and temperature of the water sample of Kangsabati river through various estimation formula in laboratory of dept. of zoology Jhargram raj college.

- Site of collection:
- Fish Collection:

River	Site of Fish Collection
1.Keleghai river	1.Dhokra Bank (22^{o}06’01.3” N/87^{0}37’29.6” E) 2.Nedhua (22^{0}05’51.4” N/87^{0}34’53.8” E) 3.Bangaldari (22^{0}05’25.0” N/87^{0}33’33.0” E) 4.Kusum Danga(22^{0}07’43.1” N/87^{0}22’45.4”E) 5.Dewati (22^{0}5’25.5” N/87^{0}29’42.0” E)
2.Kangsabati river	1.Shal Dahari River Bank (22^{0}29’20.15” N/87^{0}33’29.59” E) 2.Pathra River Bank (22^{0}24’27.00” N/87^{0}25’1.67” E) 3.Najargunj river Bank (22^{0}24’3.73” N/87^{0}18’45.15” E) 4.Payragunj river Bank (22^{0}27’39.86” N/87^{0}5’27.83” E) 5.Balishira River Bank (22^{0}29’44.60” N/87^{0}4’6.24” E)
3.Kapaleswari river	1.Jorura (22^{0}10’17.60” N/87^{0}35’11.75” E) 2.Uttar Bansbani(22^{0}9’22.34” N/87^{0}36’31.8”E) 3.Narayanbargh (22^{0}07’08.8” N/87^{0}36’31.8” E) 4.Gopal Chak(22^{0}06’58.1” N/87^{0}37’32.4”E)

- Water collection:

Place: Dherua, Paschim Medinipur, West Bengal

Longitude&Latitude: 22.4884^{0}N,87.0932^{0}E

- Data Analysis:

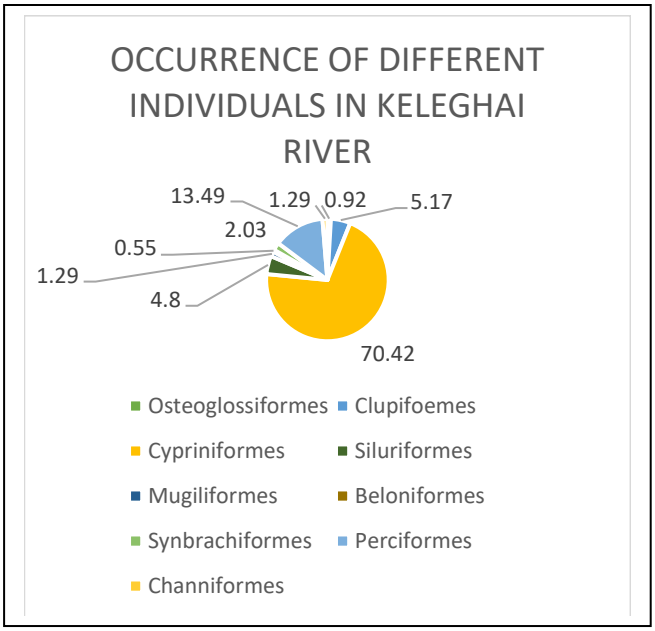
Keleghai river (As per Pahari, R.P et al 2017)

Sl no	Scientific Name	Count
1	*Notopterus notopterus*	**3**
2	*Chitala chitala*	**2**
3	*Sardinella phasa*	**13**
4	*Sardinella lomgiceps*	**8**
5	*Gudusia chapra*	**5**
6	*Tenualosa ilisha*	**2**
7	*Amblypharyngod onmola*	**165**
8	*Cirrhinus mrigala*	**8**
9	*Cyprinus carpio*	**6**
10	*Catla catla*	**3**
11	*Hypophthalmichthys molitrix*	**7**
12	*Labeo rohita*	**4**
13	*Labeo bata*	**77**
14	*Puntius sophore*	**5**
15	*Puntius sarana*	**3**
16	*Salmophasia phulo*	**7**
17	*Rohtee cotio*	**13**
18	*Barbonymus gonionotus*	**12**
19	*Labeo calbasu*	**20**
20	*Ctenopharyngodon idella*	**3**
21	*Mylophayngodon piceus*	**4**
22	*Amblyphayngodon microlepis*	**5**
23	*Chagunius chagunio*	**8**
24	*Esomus daricus*	**13**
25	*Lepidocephalichthys thermalis*	**11**
26	*Lepidocephalichthys berdmorei*	**7**
27	*Ompok pabda*	**2**

Sl no	Scientific name	Count
28	*Wallango attu*	**4**
29	*Clarias batrachus*	**4**
30	*Carias magur*	**2**
31	*Heteropneustes fossilis*	**3**
32	*Pangasius pangasius*	**3**
33	*Mystus gulio*	**3**
34	*Mystus tengara*	**5**
35	*Liza persia*	**7**
36	*Xenonthodon cancilla*	**3**
37	*Mastacembelus armatus*	**4**
38	*Mastacembelus pancalus*	**7**
39	*Chanda nama*	**11**
40	*Parambasis ranga*	**4**
41	*Ambasis nalua*	**6**
42	*Lates calarifer*	**3**
43	*Nandus meni*	**8**
44	*Nandus nandus*	**3**
45	*Badis badis*	**4**
46	*Anabas testudineus*	**6**
47	*Polycanthus fasciatus*	**4**
48	*Colisa laila*	**3**
49	*Oreochromis niloticus*	**3**
50	*Glossogobius guiris*	**7**
51	*Pseudapocryptes lanceolatus*	**8**
52	*Scatophagus argus*	**3**
53	*Channa punctata*	**4**
54	*Channa striata*	**3**

Occurrence of different individual

Sl no	order	%
1-2	Osteoglossiforms	0.92
3-6	Clupiformes	5.17
7-26	Cypriniformes	70.42
27-34	Siluriforms	4.80
35	Mugliformes	1.29
36	Beloniformes	0.55
37-38	Synbranchiformes	2.03
39-52	Perciformes	13.49
53-54	Channiformes	1.29



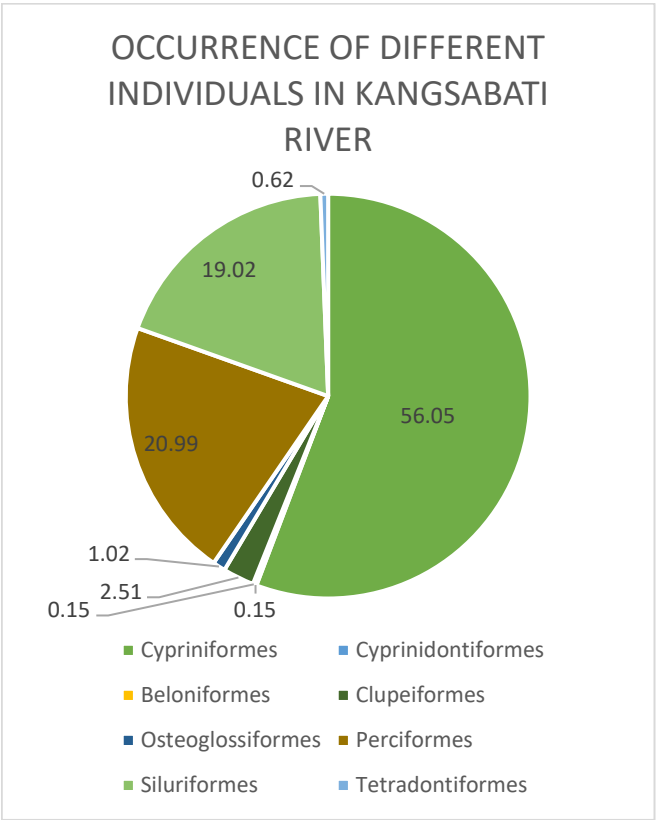
Kangsabati river (As per Kar et al. 2017)

Sl no	Scientific name	Count
1	*Osteobrama catio catio*	**4**
2	*Danio devario*	**61**
3	*Danio rerio*	**43**
4	*Puntius ticto*	**154**
5	*Puntius sophore*	**63**
6	*Puntious phutunio*	**11**
7	*Puntious conchonius*	**37**
8	*Salmostoma acalia*	**42**
9	*Labeo calbasu*	**5**
10	*Labeo bata*	**20**
11	*Labeo rohita*	**14**
12	*Cirrhinus mrigala*	**11**
13	*Catla catla*	**11**
14	*Amblypharyngodon mola*	**200**
15	*Esomus Danricus*	**5**
16	*Salmophasia bacaila*	**12**
17	*Salmophasia phulo*	**13**
18	*Lepidocephalichthys guntea*	**7**
19	*Aplocheilus panchax*	**2**
20	*Xenentodon Cancilia*	**2**
21	*Gudusia chapra*	**32**
22	*Notopterus chitala*	**5**
23	*Notopterus notopterus*	**08**

Sl no	Scientific name	Count
24	*Channa punctata*	**70**
25	*Channa marulias*	**9**
26	*Channa gachua*	**11**
27	*Channa striatus*	**10**
28	*Glossogobius giuris*	**13**
29	*Nandus nandus*	**7**
30	*Chanda ranga*	**13**
31	*Chanda nama*	**18**
32	*Colisa fasciata*	**60**
33	*Colisa lala*	**56**
34	*Mystus cavassius*	**57**
35	*Mystus aor*	**13**
36	*Mystus seenghala*	**1**
37	*Mystus tengara*	**70**
38	*Mystus vittatus*	**64**
39	*Rita rita*	**1**
40	*Clarias batrachus*	**9**
41	*Pungasius pungasius*	**5**
42	*Bagarius bagarius*	**1**
43	*Wallago attu*	**5**
44	*Heteropneustes fossilis*	**6**
45	*Macrognathus pancalus*	**10**
46	*Tetradon cutcutia*	**1**

Occurrence of Different individual

Sl no	order	%
1-18	Cypriniformes	56.05
19	Cyprinidontiforms	0.15
20	Beloniformes	0.15
21	Clupeiformes	2.51
22-23	Osteoglossiformes	1.02
24-33	Perciformes	20.99
35-45	Siluriformes	19.02
46	Tetradontiformes	0.62



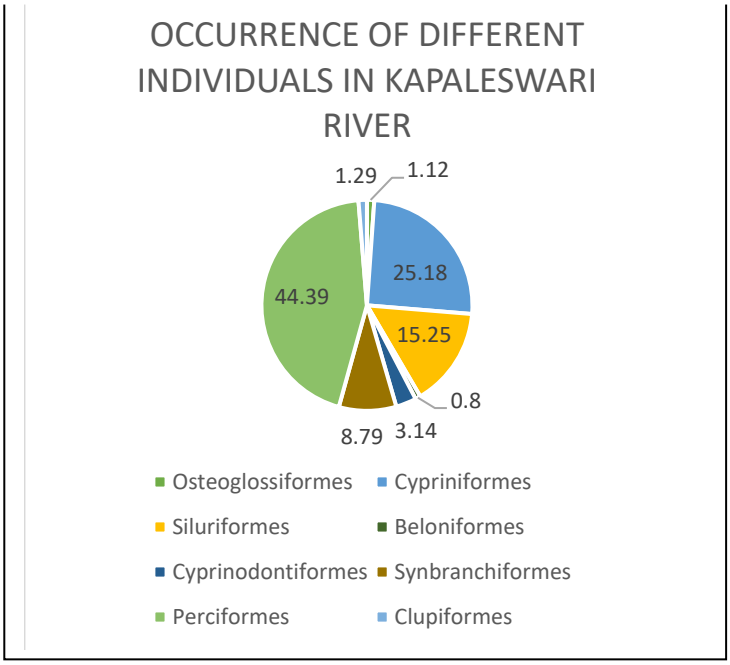
Kapaleswari river (As per Jana et al. 2021)

Sl no	Scientific name	Count
1	*Notopterus notopterus*	**14**
2	*Amblypharyngodon mola*	**36**
3	*Danio rerio*	**26**
4	*Esomus danricus*	**27**
5	*Puntius chola*	**30**
6	*Puntius conchonius*	**14**
7	*Puntius ticto*	**18**
8	*Puntius sophore*	**20**
9	*Puntius terio*	**12**
10	*Puntius sarana*	**7**
11	*Salmophasia bacaila*	**19**
12	*Labeo rohita*	**15**
13	*Labeo calbasu*	**16**
14	*Labeo bata*	**18**
15	*Catla catla*	**20**
16	*Cirrhinus mrigala*	**17**
17	*Lepidocephalichthys guntea*	**10**
18	*Lepidocephalichthys thermalis*	**7**
19	*Mystus cavasius*	**14**
20	*Mystus vittatus*	**43**
21	*Mystus tengara*	**50**
22	*Mystus blekeri*	**19**
23	*Sperata aor*	**6**
24	*Clarias batrachus*	**16**
25	*Ompok pabo*	**7**
26	*Wallago attu*	**7**
27	*Heteropneustes fossilis*	**20**
28	*Pangasius pangasius*	**7**

Sl no	Scientific name	Count
29	*Xenentodon canciila*	**10**
30	*Aplocheilus panchax*	**30**
31	*Oryzias melastigma*	**9**
32	*Macrognathus aral*	**17**
33	*Macrognathus pancalus*	**53**
34	*Mastacembelus armatus*	**29**
35	*Monopterus cuchia*	**10**
36	*Chanda nama*	**29**
37	*Parambassis baculis*	**9**
38	*Parambassis lala*	**8**
39	*Parambassis ranga*	**10**
40	*Badis badis*	**28**
41	*Anabas testudineus*	**68**
42	*Anabas cobojius*	**10**
43	*Trichogaster fasciata*	**54**
44	*Trichogaster lalius*	**27**
45	*Channa punctata*	**72**
46	*Channa orientalis*	**24**
47	*Channa striata*	**26**
48	*Glossogobius giuris*	**75**
49	*Odontamblyopus rubicandus*	**30**
50	*Pseudapocryptes elongatus*	**29**
51	*Stigmatogobius sadanundio*	**7**
52	*Gobiopsis macrostoma*	**12**
53	*Nandus nandus*	**18**
54	*Nandus meni*	**6**
55	*Lates calcarifer*	**8**
56	*Gudusia chapra*	**16**

Occurrence of Different Individuals

Sl no	order	%
1	Osteoglossiformes	1.12
2-18	Cypriniformes	25.18
18-28	Siluriformes	15.25
29	Beloniformes	0.80
30-31	Cyprinodontiformes	3.14
32-35	Synbranchiformes	8.79
36-55	Perciformes	44.39
56	Clupiformes	1.29



- Result:

For Diversity analysis:

Diversity indices→ Rivers ↓	Shannon wiener Index(H')	Simpson's Index(D)	Margalef's index(R)
Keleghai River	2.929	0.1195	8.42
Kangsabati river	3.115	0.0637	6.29
Kapaleswari River	3.66	0.0264	7.72

For Physiochemical Parameters of Kangsabati river:

Dissolved oxygen	Dissolved free Co_2	Alkalinity	pH	Temperature
4.83±0.33mg/l	4mg/l	104±1.63mg/l	7	28^{o}c

NOTE: Calculations are after the reference.

- Discussion:

Diversity analysis:

The present study involves two components, The number of species and the distribution of individuals among total species. After the analysis of the data:

In Keleghai river the value of Shannon wiener index is 2.929. it's indicated the habitat of the river is stable condition and diversity is high. And the water quality is moderately contaminated. Simpson's index is 0.1195, that indicate diverse fish population. The value of Margalef's index is 8.42. this value indicates the species richness is high.

In Kangsabati river the value of Shannon wiener index is 3.115, it's indicated the habitat of the river is stable condition and diversity is high, the water quality is non contaminated. Simpson's index 0.0637, it's indicated diverse fish population. The value of margalef's index 6.29, it's indicated relatively low species richness.

In Kapaleswari river the value of Shannon wiener index is 3.66, it's indicated the habitat of the river is stable condition and diversity is very high. The water quality of this non contaminated. Simpson's index is 0.0264, That indicate highly diverse fish population.The value of Margalef's index 7.72,this value indicate high species richness.

Among this three-river Kangsabati river has low species richness maybe the main cause of the low species richness is heavy pollution and more anthropogenic activity. And Kapaleswari river has very high species diversity maybe the main cause of high species diversity Kapaleswari river is small river and no big city are found around the river so pollution and anthropogenic activity are low. And those cases it represents high ichthyofaunal diversity.

Order cypriniformes are most dominant group in Keleghai river (70.42%) and Kangsabati river (56.05%) and order Perciformes are most dominant group in Kapaleswari river (44.39%). 2nd and 3rd most riches order of Keleghai and Kangsabati river are Siluriformes and Perciformes and in Kapaleswari river are Cypriniformes and Siluriformes; So, this report indicate maximum Cypriniformes, Perciformes and Siluriformes fishes were found in Paschim Medinipur District.

Physiochemical parameters study:

The water quality affects fish growth and development and ichthyofaunal diversity.in this study Kangsabati river water parameters are:

Do level is 4.83mg/l$\pm$0.33, the normal value range of Do for fish diversity is 4.6 to 6.0 mg/l. Free co2 level is 4mg/l$\pm$0, the normal value of free co2 for fish diversity is<5mg/l. Alkalinity level is 104mg/l$\pm$1.63, the normal value for fish is 100mg/l to 400mg/l. And pH is 7, the normal value for fish 7 to 7.4. And Temperature is 28^{0}C. These Physiochemical parameters value is very satisfactory for fishes. Standard value is collected from BIS (Bureau of Indian standards).

- Conclusion:

The Shannon wiener index, Simpson's and Margalef index showed that the diversity and richness of fishes in Keleghai, Kangsabati and Kapaleswari river. And Physiochemicak parameter refers that the water condition of kangsabati river in Dherua.

In this study reveal that the Keleghai river water is moderately polluted, Species richness is relatively low in Kangsabati river, high diversity was found in Kapaleswari river.

Physiochemical parameters study of Kangsabati river reveal the water condition of this river is stable for fish diversity sustain.

The drawback of my study is the water was collected from Kangsabati river during pre-monsoon period only of this year which is not enough good for proper study of river diversity sustain.

Future scope of study Kangsabati river has four tributaries viz. Saharjhora, Bandu, Kumari, Bhairavbakhi diversity among these tributaries has not yet been measured. And Keleghai river has two tributaries Kapaleswari and Chandia, among them the diversity of Chandia River has not yet been measured.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

Dissertation on

Preliminary Study of Macro Fauna of Chilkigarh, West Bengal, India

Paper Code: ZOO 496B

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Preliminary Study of Macro Fauna of Chilkigarh, West Bengal, India.

Submitted by

Sourav Karan

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This Dissertation is submitted for the partial fulfilment of M.Sc. degree in Zoology, Vidyasagar University

2022

Declaration by student

I do hereby declare that the present Dissertation entitled **"Preliminary Study of Macro Fauna of Chilkigarh, West Bengal, India"** has been carried out by me in the Department of Zoology, Jhargram Raj College, Jhargram, under the guidance of Shri Sanjib Kumar Das (Assistant Professor), Department of Zoology, Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

Date: 25 · 08 · 2022

Sourav Karan

(Sourav Karan)

सत्यमेव जयते

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Jhargram, 721 507

To whom it may concern

This is to certify that the Dissertation work entitled **"Preliminary Study of Macro Fauna of Chilkigarh, West Bengal, India"** has been carried out by Sourav Karan student of M.Sc. (Semester IV), Depatment of Zoology, Jhargram Raj College under my guidance for the partial fulfillment of the M.Sc. 4th Semester Examination, 2022, under Vidyasagar University. The work has not been published or presented for any purpose according to my knowledge.

Date: 25/08/2022

Sanjib Kumar Das. 25/08/2022

(Signature)
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We have availed the facility provided by the DBT-STAR Scheme, 2019-2022 Department of Biotechnology, Govt. of India.

Table of Content

Preliminary Study of Macro Fauna of Chilkigarh, West Bengal, India.

Sourav Karan

Abstract: Chilkigarh is a rural and tribal area under jangal-mahal belt at the bank of river Dulung, 14 kms away from Jhargram town. An attempt has been made to record the composition of macro-invertebrate fauna (butterfly) & macro-vertebrate fauna (amphibia, reptilia, bird, and mammals) of Chilkigarh by various sampling methods viz Pollard Walk Method, Direct Search Technique, Opportunistic Sighting Method through photographic documentation from the month of December 2021 to July 2022. Study revealed the presence of total 110 species during the day time survey. A total 59 species of butterflies were recorded under six representative families. 11 out of these 59 species are legally protected under Wildlife (Protection) Act, 1972. Nymphalidae appeared to be the most dominant butterfly family (42.3%) compared to others. A total 37 species of birds were recorded during this study period. Most dominant species rich order was Passeriformes (54%). Based on feeding habit Omnivore becomes dominant (37.8%). A total 6 amphibian species were found from the Dulung river bank of the Chilkigarh Kanak Durga Sacred Grove, all are belonging to order Anura. Total 6 species of reptiles were found from the Chilkigarh Kanak Durga temple premises under order Squamata. According to IUCN, one reptilian species Russell's Boa (*Gongylophis conicus)* is protected under Near Threatened (NT) category. Total 2 mammalian species were identified during the study from Chilkigarh Kanak Durga mandir premises; Bengal Hanuman Langur (*Semnopithecus entellus*) is protected under WPA Schedule II. This preliminary study will provide a baseline for future investigation and conservation strategy planning of this particular area.

Keywords: Macro fauna of Chilkigarh, Pollard Walk Method, Direct Search Technique, Opportunistic Sighting Method, Wildlife (Protection) Act, 1972, Sacred grove, IUCN, Conservation.

Conclusion:

It can be concluded from the above study that Chilkigarh area is maintaining a good composition of animal species. Study was done during day time for shorter period; a more intensive study (documentation of nocturnal animals and seasonal variation) would surely result in identification of many more species in this region. This preliminary study will provide a baseline for future investigation of faunal composition on this particular area. The impact of tourism and anthropogenic alteration of habitats on the macro faunal composition in Chilkigarh, is also needed to be detailed out through intensive study. Bengal Hanuman Langur is a WPA schedule II species and is now in danger due to habitat loss, tourism, decrease in availability of food, and they are entering in the local villages in search of food, so a detailed study on them, and a strict measure and strategy has to be planned to conserve them on their natural environment.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

Dissertation on

First report of spider (Araenidae) diversity of Jhargram (Jangalmahal) district, West Bengal, India

Paper Code: ZOO 496B

Roll: PG/VUJGG21/ZOO-IVS No: 022

Registration No: 1190176 of 2017-2018

Session: 2020-2022

First report of spider (Araenidae) diversity of Jhargram (Jangalmahal) district, West Bengal, India.

Submitted by

Subham De

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Reg. No.: 1190176 of 2017-2018
Department of Zoology
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Under the guidance of

Dr. Koushik Sen
Assistant Professor
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This Dissertation is submitted for the partial fulfilment of M.Sc. degree in Zoology, Vidyasagar University

202

Declaration by student

I do hereby declare that the present Dissertation entitled **"First report of spider (Araenidae) diversity of Jhargram (Jangalmahal) district, West Bengal, India"** has been carried out by me in the Department of Zoology, Jhargram Raj College, Jhargram, under the guidance ofDr. Koushik Sen (Assistant Professor), Department of Zoology, Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

Date: 29.08.22

Subham De

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Post Graduate Department of Zoology

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To whom it may concern

This is to certify that the Dissertation work entitled **"First report of spider (Araenidae) diversity of Jhargram (Jangalmahal) district, West Bengal, India"** has been carried out by Subham De student of M.Sc. (Semester IV), Department of Zoology, Jhargram Raj College under my guidance for the partial fulfilment of the M.Sc. 4th Semester Examination, 2022, under Vidyasagar University. The work has not been published or presented for any purpose according to my knowledge.

Date: 29.08.2022.

29.08.2022.

(Signature)

5 | Page

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Table of Content

First Report of Spider (Araenidae)diversity of Jhargram (Jangalmahal) District, West Bengal, India

Subham De

Abstract:

Jhargram the district of West Bengal, India, is covered with dense forest and has floral diversity which provides suitable microhabitats for spider fauna. The present study aims to uncover the diversity ofthespiderof Jhargram (Jangalmahal). To explore spider fauna in Jhargram,different sites for the study were randomly selected.Standard sampling techniques such as visual searching, hand picking, and umbrella traps were employed to gather data. Collected specimens, as well as photographs, were used for identification. A total of 26 species belonging to 11genera and8families have been recorded and identified during the study. Analysis of the Guild structure of spiders revealed five functional groups Orb-web builder's, Ambushers, Stalkers, Foliage runners,andForaging. The present field-based survey work has enlightened the status and distribution of spiders in Jhargram. However, further large-scale study along with the use of molecular techniques such as molecular phylogeny, molecular barcoding, etc. is required for a better understanding of the scenario regarding spider diversity, distribution, guild structure, and role of spiders in shaping the forest ecosystem of Jhargram.

Key Words: Spider diversity, Guild structure,Salticidae, Jhargram biodiversity, West Bengal

1. Conclusion:

This was the first attempt on a small scale, to document spider diversity in Jhargram. The study documented 23 spider species belonging to 11 genera under 8 representative families with Salticidae being the dominant family. The Stalkers were the major guild structure. The diversity both at the ecosystem and microhabitat level supports a large number of spiders in Jhargram. Their role inmaintainingecological equilibrium by suppressing insect pests is very much significant. Theforest is under pressure due to deforestation and urbanization, resulting in habitat loss and degradation which becomes a primary threat to spiderdiversity. The distribution and patterns of spider diversity may help us to provide crucial information to justify the conservation significance of the ecosystem.This study provides baseline information on spiders inhabiting this ecosystem and opens up the scope for further research to understand the relationship of this creature with other biotic factors. In the future,amore intensive study will reveal much more information about spiders in this area.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

Dissertation on

An Account of Marine Fauna of Digha Mohana, Purba Medinipur, West Bengal, India.



Paper Code: ZOO 496B

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Registration No.: 1360471 of 2017-2018

Session: 2020-2022

An Account of Marine Fauna of Digha Mohana, Purba Medinipur, West Bengal, India.

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2022

Declaration by student

I do hereby declare that the present Dissertation entitled **"An Account of Marine Fauna of , Purba Medinipur, West Bengal, India"** has been carried out by me in the Department of Zoology, Jhargram Raj College, Jhargram, under the guidance of Smt. Sanchita Pan (SACT) and Shri Sanjib Kumar Das (Assistant Professor) Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

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This is to certify that the Dissertation work entitled**"An Account of Marine Fauna of DighaMohana, PurbaMedinipur, West Bengal, India"**has been carried out by Sukdeb Bar student of M.Sc. (Semester IV), Depatment of Zoology, Jhargram Raj College under my guidance for the partial fulfillment of the M.Sc. 4th Semester Examination, 2022, under Vidyasagar University. The work has not been published or presented for any purpose according to my knowledge.

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Table of Content

An Account of Marine Fauna of Digha Mohana, Purba Medinipur, West Bengal, India.

Sukdeb Bar

Abstract:

Digha Mohana is an important tourist destination of the Old Digha, situated at the northern end of the Bay of Bengal. A unique estuarine ecosystem develops there due to the convergence of the Champa River with the sea, providing a habitat for numerous biological lives. Trawlers sail to net fishes and unload their catch at Mohana adjoining International Fish Market. A survey was done from December 2021 to June 2022 at Mohana as well as Fish Market to document animals from diversified groups of invertebrates and vertebrates. Live specimens from the Mohana as well as freshly caught dead specimens from the fish market have been photographed. A total of 81 species representing 14 Arthropoda, 7 Mollusca, 2 Echinodermata, 11 Cartilaginous fishes, and 47 Bony fishes was documented. According to CITES the arthropods and molluscans are in not evaluated (NE) status. According to IUCN Ver 3.1, 2 echinoderms are in LC status. Out of 11 Cartilaginous fishes 5 are in VU, 2 arein NT, 2 are in CR and 1 in EN status. Out of 47 bony fishes 2 are in NT and 2 are in VU status. This short survey will serve as the baseline for the future work regarding identification, documentation, evaluation of conservation statusand planning for conservation strategies in this area to maintain sustainable development.

Keywords: Fish, Digha Mohana, Estuarine faunal diversity, Marine ecosystem, Conservation strategy

Conclusion:

Environmental changes is already impacting marine biodiversity, both through its own effects on marine ecosystems and through synergistic interactions with existing stressors, such as overfishing, aquaculture practice, marine pollution, habitat distribution. These existing stressors are destroying the marine environment. So, need to protect the marine ecosystems through the Governmental rules like Environmental Impact Assessment (EIA), Environmental regulations, Ecological restoration, Environmental monitoring and scientific research. Implementation of sustainable development programs to reduce the pollution for the protection and conservation of the marine environment, because the marine floral and faunal community is an important elements to the marine environment.

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Jhargram Raj College

(Affiliated under Vidyasagar University)

Dissertation on

The Study of Red Weaver Ant at Belpahari, Jhargram, West Bengal

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The Study of Red Weaver Ant at Belpahari, Jhargram, West Bengal

Submitted by

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This dissertation is submitted for the partial fulfilment of M.Sc. degree in Zoology, Vidyasagar University

2022

Declaration by student

I do hereby declare that the present Dissertation entitled **"The Study of Red Weaver Ant at Belpahari, Jhargram, West Bengal"** has been carried out by me in the Department of Zoology, Jhargram Raj College, Jhargram, under the guidance of Dr. Debnarayan Roy, Principal and Smt. Sanchita Pan, SACT, Dept. of Zoology, Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

Date: 26.08.2022

Surya Kanta Paine

(Surya Kanta Paine)

Post Graduate Department of Zoology

Jhargram Raj College

(Government of West Bengal)

Jhargram, 721 507

To whom it may concern

This is to certify that the Dissertation work entitled "**The Study of Red Weaver Ant at Belpahari, Jhargram, West Bengal**" has been carried out by Surya Kanta Paine student of M.Sc. (Semester IV), Department of Zoology, Jhargram Raj College under my guidance for the partial fulfilment of the M.Sc. 4th Semester Examination, 2022, under Vidyasagar University. This work has not been published or presented for any purpose according to my knowledge.

26/08/2022

(Signature)

Date:

26/08/2022

(Signature)

Date:

ACKNOWLEDGEMENT

I acknowledge my indebtedness to Dr.Debnarayan Roy, Principal of Jhargram Raj College for giving me the scope to present this dissertation.

I am equally thankful to Dr.Rahul Kumar Datta, Associate Professor & Head, Department of Zoology, Jhargram Raj College for the encouragement.

I pay my great regards, sincere gratitude and gratefulness to Dr. Debnarayan Roy, Principal of Jhargram Raj College and Smt. Sanchita Pan, SACT, Dept. of Zoology, Jhargram Raj College for helpful suggestions and inspiration during the tenure of study as well as preparing this work. The presentation of the seminar and this review has been possible for me for their guidance.

It is great pleasure to express my thanks to all my departmental teachers namely Dr. Krishnendu Sinha (Assistant Professor), Dr. Koushik Sen (Assistant Professor), Shri Sanjib Kumar Das (Assistant Professor), Shri Sourav Barai (Assistant Professor), Md. Shariful Islam (Assistant Professor), Assistant Professor for necessary helps as and when required.

I would like to thanks all of my friends who help me in various ways to carry out my review work successfully.

It is impossible for me to work without the benevolence and blessing of my parents who always supported me in achieving my goals.

We have availed the facility provided by the DBT-STAR Scheme, 2019-2022, Department of Biotechnology, Govt. of India.

CONTENTS

The Study of Red Weaver Ant at Belpahari, Jhargram, West Bengal

ABSTRACT

The study reveals the documentation of the social organisation, nest building and feeding behaviour, life cycle, collection and utilisation and benefits of red weaver ants among the tribes of Belpahari of Jhargram district. The Red weaver ants, locally known as **Kurkut** *(Oecophylla smaragdina)* in the forests of Belpahari are collected by indigenous people during the winter period. Among other resources red ants constitute an integral part of sociocultural life of these people. These ants are utilised for varied purposes, the most notable being for food, medicine and livelihoods of tribal people. The dietary and medicinal uses of these red weaver ant suggests that it may become an alternative source of nutrition and medicine for mankind in the future.

Key words:

Belpahari, Tribes, Entomophagy, Tribal people, Ethno-entomological values, Kurkut, *Oecophylla*

CONCLUSION

The study concluded the polymorphic social organisation, unique nesting and feeding behaviour and holometabolous type of life cycle of the red weaver ants. It also concluded the ancient process of collection and various use of these ants as food, medicine and commercial item by the tribes of Belpahari, Jhargram. These ants are very much involved with the socio-economy of the tribes. If these ants are cultivated commercially, they will become a source of income along with nutritious food and medicine in the near future. Further research should undertake to discover other insects with this kind of ethno-entomological significance.

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Cir. No. 07

JHARGRAM RAJ COLLEGE

10.01.2023

It is hereby notified to all concerned students that the Internal Examinations (Semester I and Semester III) of UG courses for B.A. / B.Sc. / B.Com. (Hons. and Gen) under CBCS pattern of Vidyasagar University will be conducted as per the following schedule.

COMMERCE DEPARTMENT (HONS. & GE.): As per the discretion of the respective department.
ARTS & SCIENCE DEPARTMENTS (HONOURS): As per the discretion of the respective departments.

Semester-I

DATE	SUBJECT	COURSE	TIME	ROOM NO	Name of Teacher
16.01.2023 Monday	Chemistry, Physics Mathematics Botany,	GE1	11:00-11:30 AM	CH10	Tapas Ghosh,Chandrani Roy, Manowar Ali
	Philosophy, Sanskrit		11:00-11:30 AM	LH7	Milan Kumar Mal,Dr. Sudip Kumar Das Debasis Manna,Sridam Ghosh
	Physiology, Political Science		01:00-01:30 PM	LH7	Chandrani Roy, Manowar Ali, Sankhadip Maity
	Bengali, Mathematics	DSC	02:00-02:30 PM	LH2	Milan Kumar Mal,Dr. Sudip Kumar Das Debasis Manna
				LH5	Subhadip Sau,Tarun Mistri, Tapas Ghosh
				LH7	Sankhadip Maity,sikandar Ansari, Arobinda samanta,Sridam Ghosh
				CH10	Dilip Rout,Md Bodruddoza Arefin,Sanchayita Adikari
	Political Science, Physics		03:00-03:30 PM	LH2	Sridam Ghosh, Tarun Mistri, Naba Kumar Mondal, Subhadip Sau
17.01.2023 Tuesday	Sanskrit, Botany	DSC	11:00-11:30 AM	CH10	Subhasree Pradhan, Satabdi Das Debashis Manna, Abhoy De
	Physical Education		12:00-12:30 PM		
	History		01:00-01:30 PM	LH7	Prabir Das Ajoy Gopal Bera, Chandrani Roy, Debashree Mahapatra,
	Philosophy, Chemistry		02:00-02:30 PM		
	English, Physiology, Zoology		03:00-03:30 PM	LH2	Debanjan Das Koushik Sen, Subhadip Sau Tarun Mistri
20.01.2023 Friday	English-1 (B.A./B.Com. Gen.)	AECC-Core	11:00-11:30 AM	CH10,	Sourav Pal Sankhadip Maity Sreejit Ghosh Sayantan Roy
				LH7,	Chattradhar Dey,Biswajit Dutta Bhabesh Mahata Oindrila Sen
				LH2	Ranjit Kumar Kapat Dalia Mahata Rajesh Kumar Pandey,Debanjan Das
				LH5	Susovan Mondal, Baisakhi Kundu Prabir Das
20.01.2023 Friday	English (B.A./B.Sc./B. Com- Hons.)	AECC Elective	01:30-02:00 PM	CH10,	Sourav Pal, Susovan Mondal, Sreejit Ghosh , Sayantan Roy
20.01.2023 Friday	Bengali (B.A/, B.Sc./ B.Com. Gen)		02:30-03:00 PM	LH7,	Chattradhar Dey Biswajit Dutta Bhabesh Mahata,Krishnendu Sinha
				LH2	Ranjit Kumar Kapat, Dalia Mahata, Rajesh Kumar Pandey, Debanjan Das
				LH5	Susovan Mondal, Baisakhi Kundu Prabir Das

Semester-III

DATE	SUBJECT	COURSE	TIME	ROOM NO	Name of Teacher
18.01.2023 Wednesday	Bengali, English,	GE3	11:00-11:30 AM	CH10	Debashree Mahapatra Ajoy Gopal Bera Manowar Ali, Naba Kumar Bera
	History,		11:00-11:30 AM	LH2	Chandrani Roy Aboy De, Koushik Sen
	Mathematics, Chemistry, Physics		12:00-12:30 PM	CH10	Debashree Mahapatra Ajoy Gopal Bera Manowar Ali
	Physiology, Zoology		01:00-01:30 PM	LH7	Bhabesh Mahata Chatradhar Dey Sanchita Pan Momijul Haque
	Bengali, Mathematics	DSC, SEC	02:00-03:00 PM		
	Political Science, Physics		03:00-04:00 PM	LH2	Chandrani Roy Pravanjan Jana Aboy De, Koushik Sen
19.01.2023 Thursday	Sanskrit, Botany	DSC, SEC	11:00-12:00 NOON	CH10	Biswajit Dutta Sanjib Kumar Das Krishnendu Sinha, Naba Kumar Bera
	Physical Education, Zoology		12:00-01:00 PM	LH7	Sanjib Kumar Das Satabdi Das Dalia Mahata Dr. Sudip Kumar Das
	History		01:00-02:00 PM	CH10	Momijul Haque, Oindrila Sen, Bodruddoza Arefin, Subhasree Pradhan
	Philosophy, Chemistry		02:00-03:00 PM	LH7	Ranjit Kumar Kapat Milan Kumar Mal Sridam Ghosh
	English, Physiology		03:00-04:00 PM	LH2	Dalia Mahata Sourav Barai Md Bodruddoza Arefin, Tapas Ghosh
20.01.2023 Friday	English-2 (B.A./B.Com. Gen.)	AECC-Core	12:00-12:30 PM	CH10	Sourav Pal Sankhadip Maity Sreejit Ghosh Sayantan Roy
				LH2	Ranjit Kumar Kapat Dalia Mahata Rajesh Kumar Pandey Debanjan Das
				LH7,	Chattradhar Dey Biswajit Dutta Bhabesh Mahata Krishnendu Sinha
				LH5	Prabir Das, Sourav Barai

N.B. Examinations date may change in case of any unavoidable circumstances.
For any query students are instructed to contact to their respective departments.

Countersigned

11/01/2023

Principal
Jhargram Raj College

11/01/23

Convener
Internal Examination Sub-Committee (UG CBCS)

Cir. No. 90

10.06.2022

JHARGRAM RAJ COLLEGE

It is hereby notified to all concerned students that the Internal Examinations (Semester II and Semester IV) of UG courses for B.A. / B.Sc. / B.Com. (GE and DSC) under CBCS pattern of Vidyasagar University will be conducted in online mode as per the following schedule.

COMMERCE DEPARTMENT (HONS. & GE.): As per the discretion of the respective department.

ARTS & SCIENCE DEPARTMENTS (HONOURS): As per the discretion of the respective departments.

SCIENCE DEPARTMENTS (GE & DSC COURSES)

Date and Day	Subject	Course	Semester	Time
14.06.2022 (Tuesday)	Physics, Botany and Economics	GE, DSC GE, DSC, SEC 2	II IV	10.00 am to 1.00 pm
15.06.2022 (Wednesday)	Chemistry	GE, DSC GE, DSC, SEC 2	II IV	10.00 am to 1.00 pm
16.06.2022 (Thursday)	Mathematics and Zoology	GE, DSC GE, DSC, SEC 2	II IV	10.00 am to 1.00 pm
17.06.2022 (Friday)	Physiology	GE, DSC GE, DSC, SEC 2	II IV	10.00 am to 1.00 pm

ARTS DEPARTMENTS (All GE COURSES FOR HONOURS Students)

Date and Day	Subject	Course	Semester	Time
14.06.2022 (Tuesday)	Bengali, English, Sanskrit, History, Philosophy and Political Science	All GE courses	II, IV	10 am to 12.00pm

ARTS DEPARTMENTS (GENERAL Students)

Date and Day	Subject	Course	Semester	Time
14.06.2022 (Tuesday)	Bengali	DSC DSC, SEC 2	II IV	10.00 am to 12.00 noon 10.00 am to 1.00 pm
	English	DSC DSC, SEC 2	II IV	12.30 pm to 2.30 pm 12.30 pm to 4.30 pm
	Sanskrit	DSC DSC, SEC 2	II IV	3.00 pm to 4.00 pm 4.00 pm to 5.00 pm
15.06.2022 (Wednesday)	History	DSC DSC, SEC 2	II IV	10.30 am to 12.00 noon 10.00 am to 1.00 pm
	Philosophy	DSC DSC, SEC 2	II IV	12.30 pm to 2.30 pm 12.30 pm to 3.30 pm
	Political Science	DSC DSC, SEC 2	II IV	3.00 pm to 5.00 pm 3.00 pm to 6.00 pm
16.06.2022 (Thursday)	Physical Education	DSC DSC, SEC 2	II IV	10.00 am to 12.00 noon 10.00 am to 1.00 pm

ALL STUDENTS (HONS & GENERAL)

Date and Day	Subject	Course	Semester	Time
18.06.2022 (Saturday)	Science/Arts/ Commerce (HONS & GEN)	AECC ENVS	II	10.00 am to 01.00 pm
	Arts/ Commerce (GEN)	BENG MIL -1	II	1.00 pm to 02.00 pm
	Arts/ Commerce (GEN)	BENG MIL -2	IV	01.00 pm to 02.00 pm

Countersigned

Principal
Jhargram Raj College

Principal
Jhargram Raj College

Ushasi Dutta

Convener
Internal Examination Sub-Committee (UG CBCS)

INSTRUCTIONS FOR STUDENTS

It is hereby notified to all concerned students that the Internal Examinations (GE/DSC) for Semester II & IV B.A. / B.Sc. under CBCS pattern of Vidyasagar University will be conducted from June 14th to The examination will be held through **online mode.**.

- The Link will be shared fifteen minutes (15 minutes) before the commencement of the examination.
- The link ***will be displayed in the college website under the Examination Notification of Students' Zone*** .
- For B.A. / B.Sc. students will obtain their question papers by clicking

  Semester → Paper (GE/DSC) → Required Subject

Instruction for submission of answer script

- Students must write their **Name, Previous Semester Roll No or current semester roll no (if available) along with Previous Semester or current semester Registration No with year, Subject and Paper Code** on the top of their answer script.
- Students are directed to send the answer scripts in PDF format to the e-mail ID or as specified in the question paper.
- Subject of Email must be as File Name: Full Roll No._Subject_Paper Code.
- PDF File name must be as follows: Full Roll No._Subject_Paper Code.
- ❖ Students should be extremely careful during submission of answer scripts in wrong e-mail ID is subjected to be cancelled.

Cir. No. 192

JHARGRAM RAJ COLLEGE

12.12.2022

It is hereby notified to all concerned students that the Internal Assessment of Semester V of UG courses for B.A. / B.Sc. / B.Com. (GE, DSE and SEC)-2022, under CBCS pattern of Vidyasagar University will be conducted as per the following schedule.

COMMERCE DEPARTMENT (Hons. and Gen.) As per the discretion of the respective department.
ARTS & SCIENCE DEPARTMENTS (Hons.): As per the discretion of the respective departments.

SCIENCE DEPARTMENTS- (GE, DSE and SEC COURSES)

Date	Subject	Paper	Room No	Time
13.12.2022 (Tuesday)	Botany Physics	DSE DSE	CH10	11:30 am to 12:00
14.12.2022 (Wednesday)	Zoology Mathematics	DSE, SEC DSE, SEC	CH10	11:30 am to 12:30 pm
15.12.2022 (Thursday)	Physiology Chemistry	DSE, SEC DSE, SEC	CH10	11:30 am to 12:30 pm 01:00 pm to 02:00 pm

ARTS DEPARTMENTS (GENERAL Students)

Date and Day	Subject	Course	Room No	Time
13.12.2022 (Tuesday)	Bengali	GE , DSE, SEC	LH2	11:00 am to 12.30 pm
	Political Science	GE, DSE	LH7	01:00 pm to 02.00 pm
14.12.2022 (Wednesday)	Philosophy	GE, DSE	LH2	11:00 am to 12:00 noon
	History	GE, DSE	LH7	12:30 pm to 01.30 pm
15.12.2022 (Thursday)	English	GE , DSE, SEC	LH2	11:00 am to 12.30 pm
	Physical Education	GE, DSE, SEC	LH2	01:00 pm to 2:30 pm
	Sanskrit	GE, DSE	LH7	01:00 pm to 2:00 pm

N.B. Examinations date may change in case of any unavoidable circumstances.
For any query students are instructed to contact to their respective departments.

Countersigned

Principal
Jhargram Raj College

Joint-Convener
Internal Examination Sub-Committee (UG CBCS)

Cir. No. 10 **JHARGRAM RAJ COLLEGE** **14.01.2023**

This is to notify for all concerned students that due to unavoidable circumstances, the internal examination (Semester-I) of UG Courses for B.A./B.Sc./B.Com. (Hons. & Gen.) under CBCS pattern of Vidyasagar University scheduled on **16.01.2023 (notified by Cir. No. 05, dated 05.01.2023) has been rescheduled and will be conducted on 30.01.2023.**

The other details related to examination schedule will remain same.

Countersigned

Principal
Jhargram Raj College

Convener
Internal Examination Sub-committee (UG CBCS)

Copy to:
1. IQAC Coordinator
2. Secretary, Teachers' Council
3. All HODs
4. Guard File
5. Convener, Website Sub Committee

Cir. No. 90

26.05.23

JHARGRAM RAJ COLLEGE

It is hereby notified to all concerned students that the Internal Examinations, 2023 (Semester VI) of UG courses for B.A. / B.Sc. / B.Com. (DSC) under CBCS pattern of Vidyasagar University will be conducted as per the following schedule.

SCIENCE DEPARTMENTS (GENERAL STUDENTS)

Date and Day	Subject	Course	Semester	Room No	Time
05.06.2023 (Monday)	Physics, Botany and Economics	DSE, SEC 4	VI	CH-10	11.30 am to 12.00 pm 12.00 pm to 12.30 pm
06.06.2023 (Tuesday)	Chemistry and Physiology	DSE ,SEC 4	VI	LH 7	11.30 am to 12.00 pm 12.00 pm to 12.30 pm
07.06.2023 (Wednesday)	Mathematics and Zoology	DSE ,SEC 4	VI	CH 10	11.30 am to 12.00 pm 12.00 pm to 12.30 pm

ARTS DEPARTMENTS (GENERAL STUDENTS)

Date and Day	Subject	Course	Semester	Room No	Time
05.06.2023 (Monday)	Bengali	GE 2, DSE, SEC 4	VI	LH 2	11:00 am to 11:30 pm 11.30 pm to 12.00 pm 12.00 pm to 12.30 pm
	English	GE 2, DSE	VI	CH 10	1:00 pm to 1:30 pm 1:30 pm to 2:00 pm
	Sanskrit	GE 2, DSE	VI	LH 2	2:30 pm to 3:00 pm 3.00 pm to 3.30 pm
06.06.2023 (Tuesday)	History	GE 2, DSE, SEC 4	VI	LH 2	11:00 am to 11:30 pm 11.30 pm to 12.00 pm 12.00 pm to 12.30 pm
	Political Science	GE 2, DSE,	VI	CH 10	12.30 pm to 1.00 pm 1:00 pm to 1:30 pm
	Philosophy	GE 2, DSE, SEC 4	VI	LH 2	1:30 pm to 2:00 pm 2.30 pm to 3.00 pm 3.00 pm to 3.30 pm
07.06.2023 (Wednesday)	Physical Education	GE 2, DSE, SEC 4	VI	LH 2	11:30 am to 12:00 pm 12.00 pm to 12.30 pm 12.30 pm to 1.00 pm

N.B. Examinations date may change in case of any unavoidable circumstances.
For any query students are instructed to contact to their respective departments.

Countersigned

Principal
Jhargram Raj College

for 26/05/23

Convener
Internal Examination Sub-Committee (UG CBCS)

ঝাড়্গ্রাম রাজ কলেজ
দর্শন বিভাগ

Internal Examination 2022
3rd Semester Philosophy (General)
DSC 1/2 Logic

<u>উত্তরপত্রে পরীক্ষার্থীর নাম, কলেজ রোলনম্বর ও বিশ্ব বিদ্যালয়ের রেজিস্ট্রেশন নাম্বার স্পষ্টভাবে উল্লেখ করতে হবে।</u>

নিম্নলিখিত যে কোন পাঁচটি প্রশ্নের উত্তর দাও। ৫x২= ১০

1. অনুমান বলতে কি বোঝ ?
2. অমাধ্যম অনুমান কাকে বলে ?
3. বচনে রূপান্তর কর-
   কবিরা কদাচিৎ বাস্তববাদী হয়, শিশুরা সরল ।
4. মিশ্র প্রাকল্পিক ন্যায়যুক্তি উদাহরণ সহযোগে ব্যখ্যা কর ।
5. বিরুদ্ধ বিরোধীতার সংজ্ঞা কি ?
6. নিচের বচনটির আব র্ত নের বিব র্ত ন কর ঃ
   ছাত্ররা উপস্থিত
7. অবৈধ সাধ্য দোষ কাকে বলে ?
8. নিরপেক্ষ ন্যায়ের যে কোন দুটি নিয়ম লেখ ।
9. ভেন চিত্রের সাহায্যে নিম্নের যুক্তির বৈধতা বিচার কর
   EAO-3
10. যথার্থ প্রকল্পের ম্যানদন্ডগুলি কি কি ?

JHARGRAM RAJ COLLEGE

JHARGRAM – 721 507

DEPARTMENT OF MATHEMATICS

INTERNAL EXAMINATION – 2022- 2023

SEM: III SUBJECT: MATHEMATICS PAPER: DSC 1C (REAL ANALYSIS)

Maximum Marks: 10

ANSWER ANY FIVE OF THE FOLLOWING

1. Let $a, b \in R$ and $ab > 0$. Prove that either $a > 0$ and $b > 0$, or $a < 0$ and $b < 0$.

2. Let S be a non – empty subset of R, bounded below and $T = \{-x : x \in S\}$. Prove that the set T is bounded above and $\sup T = -\inf S$.

3. Give an example of a set $S \subset R$ such that the set S is neither open nor closed in R.

4. If S be a non – empty bounded subset of R prove that $\sup S \in \bar{S}$ and $\inf S \in \bar{S}$.

5. Give an example of a sequence of rational numbers that converges to an irrational number.

6. Determine the limit of the sequence $\{x_n\}$ where $x_n = \frac{1}{2+n^2}$.

7. Prove that the following series is convergent –

$$1 - \frac{1}{2} + \frac{1}{3} - \cdots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots$$

8. If $\{x_n\}$ is a sequence of real numbers and $\sum x_n^2$ is convergent, prove that $\sum {x_n}/{n}$ is absolutely convergent.

****

JHARGRAM RAJ COLLEGE

B.A. General Internal Examination 2022 (under CBCS)

1st Semester

HISTORY

Paper: DSC-1A/2A

(Ancient India)

Full Marks: 10

Time: 30 minutes

Answer ***any ten*** questions: 10x1=10

1. What do you know about the Harappan script?
2. Mention any two Harappan archaeological sites in Gujarat.
3. What do you know about Kalibangan?
4. Mention any one archaeological evidence related to the Harappan religion.
5. Mention two probable causes of the decline of the Harappan culture.
6. Name any four *mahajanpadas* of the sixth century B.C.E.
7. Write a short note: Megasthenes' *Indica*.
8. What are the historical sources for the Maurya period?
9. What was *Dhamma*?
10. Who were the *Dhammamahamatyas*?
11. What are the major historical sources for the Gupta period?
12. What is the significance of Allahabad Prasasti?
13. What is *grahana-moksha-anugraha*?
14. Which Gupta ruler assumed the title of *Shakari* and why?
15. Name the Chinese traveller who came to India during the Gupta period. What is the name of the book authored by him?

Bengali Version

1. হরপ্পীয় লিপি সম্পর্কে কি জানো ?
2. গুজরাতে অবস্থিত দুটি হরপ্পীয় প্রত্নক্ষেত্রের নাম লেখ।
3. কালিবঙ্গান সম্বন্ধে কি জান ?
4. হরপ্পীয় ধর্মের একটি প্রত্নতাত্ত্বিক সাক্ষের উল্লেখ কর।
5. হরপ্পীয় সংস্কৃতির পতনের দুটি সম্ভাব্য কারণ উল্লেখ কর।
6. খ্রীষ্টপূর্ব ষষ্ঠ শতকের যে কোন চারটি মহাজনপদের নাম লেখ।
7. সংক্ষিপ্ত টীকা লেখঃ মেগাস্থিনিসের 'ইন্ডিকা'।
8. মৌর্য যুগের ঐতিহাসিক উপাদানগুলি কি কি ?
9. 'ধম্ম' কি?
10. ধম্মমহামাত্য কারা ছিল?
11. গুপ্ত যুগের প্রধান ঐতিহাসিক উপাদানগুলি কি কি ?
12. এলাহাবাদ প্রশস্তির গুরুত্ব কি ?
13. 'গ্রহণ-মোক্ষ-অনুগ্রহ' কি ?
14. 'শকারি' উপাধি কোন গুপ্ত শাসক গ্রহণ করেন এবং কেন ?
15. গুপ্ত যুগে কোন চৈনিক পর্যটক ভারতে আসেন ? তাঁর রচিত গ্রন্থের নাম কি ?

প্রথম ষন্মাস সাধারণ বাংলা অন্তর্বর্তী মূল্যায়ন ২০২২

ঝাড়গ্রাম রাজ কলেজ

বাংলা বিভাগ

পূর্ণমান ৫ সময় ৩০ মিনিট

AECC (Elective) - MIL (Bengali)

বাংলা ভাষা প্রসঙ্গ, অনুবাদ ও কথনদক্ষতা

যেকোন **একটি** প্রশ্নের উত্তর দাও। ৫ X ১ = ৫

(১) ইংরেজি থেকে বাংলায় অনুবাদ করো:

He had left his village without any previous thought or plan. If he had continued there he would have carried on the work of his forefathers—namely, tilling the land, living, marrying and ripening in his cornfield and ancestral home. But that was not to be. He had to leave home without telling anyone, and he could not rest till he left it behind a couple of hundred miles. To a villager it is a great deal, as if an ocean flowed between.

(২) বাংলা থেকে ইংরেজিতে অনুবাদ করো:

বাংলা ভাষায় বিজ্ঞানচর্চার ক্ষেত্রে সত্যেন্দ্রনাথ বসুর অমূল্য অবদান রয়েছে। তাঁর নেতৃত্বে কলকাতায় ১৯৪৮ খ্রিষ্টাব্দে বঙ্গীয় বিজ্ঞান পরিষদ গঠিত হয়। এই পরিষদের মুখপাত্র হিসাবে বাংলা ভাষার বিজ্ঞান পত্রিকা 'জ্ঞান ও বিজ্ঞান' প্রকাশিত হয়। ১৯৬৩ খ্রিষ্টাব্দে 'জ্ঞান ও বিজ্ঞান'-এ কেবলমাত্র মৌলিক গবেষণা নিবন্ধ নিয়ে 'রাজশেখর বসু সংখ্যা' প্রকাশ করে তিনি দেখান, বাংলা ভাষায় বিজ্ঞান বিষয়ক মৌল নিবন্ধ রচনা করা সম্ভব।

প্রথম ষন্মাস সাধারণ বাংলা অন্তর্বর্তী মূল্যায়ন ২০২২

ঝাড়গ্রাম রাজ কলেজ

বাংলা বিভাগ

পূর্ণমান ৫ সময় ৩০ মিনিট

AECC (Elective) - MIL (Bengali)

বাংলা ভাষা প্রসঙ্গ, অনুবাদ ও কথনদক্ষতা

যেকোন **একটি** প্রশ্নের উত্তর দাও। ৫ X ১ = ৫

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প্রথম ষন্মাস সাধারণ বাংলা অন্তর্বর্তী মূল্যায়ন ২০২২

ঝাড়গ্রাম রাজ কলেজ

বাংলা বিভাগ

পূর্ণমান ৫ সময় ৩০ মিনিট

AECC (Elective) - MIL (Bengali)

বাংলা ভাষা প্রসঙ্গ, অনুবাদ ও কথনদক্ষতা

যেকোন **একটি** প্রশ্নের উত্তর দাও। ৫ X ১ = ৫

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Department of Botany

Jhargram Raj College

B.Sc. General (Semester -I)

Internal Assessment- 2022-2023

Sub- Botany (GE); Paper: GE 1T

- **Answer any five of the following questions Time 30 min: 2×5=10**
  1. What is virulent phage?
  2. What is plasmid?
  3. Write the pigment composition of brown algae.
  4. What is cystocarp? Where it is found?
  5. What is mushroom? Give an example of it.
  6. What are amphibians of the plant kingdom?
  7. What is heterospory? Where it is found?
  8. Write the scientific name of two antibiotic producing organisms?

Department of Botany

Jhargram Raj College

B.Sc. General (Semester -I)

Internal Assessment- 2022-2023

Sub- Botany (GE); Paper: GE 1T

- **Answer any five of the following questions Time 30 min: 2×5=10**
  9. What is virulent phage?
  10. What is plasmid?
  11. Write the pigment composition of brown algae.
  12. What is cystocarp? Where it is found?
  13. What is mushroom? Give an example of it.
  14. What are amphibians of the plant kingdom?
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  16. Write the scientific name of two antibiotic producing organisms?

Phone No. : 15022
S.T.D. : 03221

Department of Political Science
Jhargram Raj College
Jhargram, Midnapur.

Ref.

Date 29.11.2022

Notice

It is notified that internal Examination of I, III & V Semester Honours Courses will be held on 29th and 30th November, 2022 as per the following schedule :

Date	Time	Courses
29.11.2022	11:00 AM Onwards	CC-I, CC-II
29.11.2022	12:00 Noon onwards,	CC-5, CC-6
30.11.2022	11:00 AM Onwards,	CC-7, CC-11, CC[illegible]

Head of Department
Department of Political Science
Jhargram Raj College

Department of Political Science
Jhargram Raj College
Jhargram, Midnapur

Phone No : 35022
S.T.D. : 03221

Ref.....

Date 24/04/2023

This is notified to all 4th and 6th semester(H)students, that their Internal Assessment will be held on 27/04/2023 and 28/04/2023 at 11:00 a.m onward. Time of each paper should be 30 minutes

Schedule

Date → 27/04/2023

4th Semester – 8th and 9th paper
6th Semester – 13th and 14th paper

Date → 28/04/2023

4th Semester – 10th paper & SEC Pa
6th Semester – DSE-3 & DSE-4 pa

For Bmahato 24/4/23.

Head of Department
Department of Political Science
Jhargram Raj College

Jhargram Raj College

Department of philosophy

Notice

This is to notify for all concerned that, the internal examination for 4th &2nd Semester students of Philosophy Honours course will be held on 29.06.2022 at Room no.U9. The schedule would be as follows ---

Paper	Date	Time	Year
CC 8, CC 9, CC10, SEC 2	29.06.2022	11.00 am to 2pm	4th Sem Hons
CC 3, CC4	29.06.2022	11.00 am to 2pm	2nd Sem Hons

Sudipta Mullick

Head

Department of Philosophy

JHARGRAM RAJ COLLEGE

Jhargram 721507

Department of History

Ref. No.: JRC/HIST/T/5/2022 Date: 22.12.2022

NOTICE

It is hereby notified that a meeting of the faculty members of the Department of History will be held on 03.01.2023, at 02:00 p.m. to discuss the following agenda.

Agenda:

1. Modalities of Semester 5 (Honours) Supplementary Internal Examination (2022)
2. Modalities of Semester 5 (General) Supplementary Internal Examination (2022)
3. Modalities of Semester 1 & 3 (Honours) Internal Examination – I (2022-23)
4. Modalities of Semester 1 & 3 (General) Internal Examination (2022-23)
5. Departmental Seminar
6. Departmental Educational Tour

All the esteemed faculty members of the department are cordially requested to attend the aforesaid meeting.

Head
Department of History
Jhargram Raj College

JHARGRAM RAJ COLLEGE

JHARGRAM – 721 507

DEPARTMENT OF MATHEMATICS

2022-2023

08.09.2022

Notice

This is to inform all students of 5th semester B.Sc. (Honours in Mathematics) that the 1st internal examination (offline mode) for the academic year 2022-2023 has been scheduled to be held as per the following schedule :-

Sl. No.	Date & Day	Time	Paper Code
1.	20.09.2022 Tuesday	11.00 AM – 12.00 PM	C11, C12
2.	21.09.2022 Wednesday	11.00 AM – 12.00 PM	DSE1, DSE2

Syllabus for the upcoming Internal Examination

Sl. No.	Paper	Syllabus
1.	C11	Unit 1
2.	C12	Unit 1
3.	DSE1	LPP by Graphical Method
4.	DSE2	Introduction to Probability

Sandip Sarkar 08/09/2022

Head, Dept. of Mathematics
Jhargram Raj College

Head, Dept. of Mathematics
Jhargram Raj College
Govt. of West Bengal
Jhargram, PIN - 721507

JHARGRAM RAJ COLLEGE

JHARGRAM – 721507

Botany Department

Ref. No. 41

Date: 24/11/22

NOTICE

All concerned students are hereby directed to follow the given schedule of internal assessment of respective papers to fulfill course curriculum:

Internal Examination schedule: -

Sl. No	Paper Code	Semester	Date	Time
1	CC 1	I	19.12.22	11 A.M
2	CC 2	I	16.12.22	12 P.M
3	CC 5	III	15.12.22	12 P.M
4	CC 6	III	15.12.22	1 P.M
5	CC 7	III	14.12.22	12 P.M
6	SEC 1	III	22.12.22	12 P.M
7	CC 11	V	28.11.22	11 A.M
8	CC 12	V	28.11.22	12 P.M
9	DSE 1	V	30.12.22	12 P.M
10	DSE 2	V	29.11.22	11 A.M

Arghya Ghosh

Dr. Arghya Ghosh
Head of the Deptt., Botany
Jhargram Raj College

DR. ARGHYA GHOSH (W.B.E.S.)
H.O.D. & ASSISTANT PROFESSOR
DEPARTMENT OF BOTANY
JHARGRAM RAJ COLLEGE
JHARGRAM - 712507

Copy to: -

1. Academic file
2. Notice book

Notice

It is hereby notified that the internal examination of 4th semester CBCS (Hons) will be held as per following schedule.

Date	Paper	Time	Name
24/07/2023	C8T	11.45 am -12.15 pm	Mathematical Physics 1
	C9T	12.30 pm–1.00 pm	Elements of Modern Physics
25/07/2023	C10 T	11.45 am -12.15 pm	Analog Systems and Applications
	SEC 2	12.30 pm–1.00 pm	Applied Optics

Ushasi Dutta
Head

Department of Physics

Signature of the teachers:

Date :- 14.07.23

Internal question paper setter

1. C8T Subhadip Sau
2. C9T Ushasi Dutta
3. C 10T Tapas Ghosh
4. SEC 2 Sourabh Mulhopadhyay
5. GE 4 Ushasi Dutta & Subhasree Pradhan
6. DSC 4 Manowar Ali

JHARGRAM RAJ COLLEGE
JHARGRAM – 721 507

DEPARTMENT OF MATHEMATICS
2022-2023

10.11.2022

Notice

This is to inform all students of 3rd semester B.Sc. (Honours in Mathematics) that the 1st internal examination (offline mode) for the academic year 2022-2023 has been scheduled to be held as per the following schedule :-

Sl. No.	Date & Day	Time	Paper Code
1.	22.11.2022 Tuesday	11.00 AM – 12.00 PM	C5, C6
2.	23.11.2022 Wednesday	11.00 AM – 12.00 PM	C7, SEC1

Syllabus for the upcoming Internal Examination

Sl. No.	Paper	Syllabus
1.	C5	Limit and Continuity
2.	C6	Groups, Sub Groups and Cyclic Groups
3.	C7	(a) System of Linear and Algebraic Equations (b) Transcendental and Polynomial Equations
4.	SEC1	Propositional Calculus

Sandip Sen Gupta 10/11/2022

Head, Dept. of Mathematics
Jhargram Raj College

Head, Dept. of Mathematics
Jhargram Raj College
Govt. of West Bengal
Jhargram, PIN - 721507

JHARGRAM RAJ COLLEGE

Department of History

B.A. Honours Internal Examination 2022 (under CBCS)

3rd Semester

Paper: CC-5

(Delhi Sultanate)

Full Marks: 10

Time: 1 Hour

Answer **any one** question: [*Write within 1000 words*] 10x1=10

1. What do you mean by Historiography? Discuss the importance of literary sources in writing the history of the Delhi Sultanate.
2. How did Iltutmish consolidate his empire in the face of external and internal difficulties?
3. Was the Delhi Sultanate a theocratic state? Justify your answer.
4. Give an account of the agrarian production system during the Delhi Sultanate.
5. Analyze the causes of conflict between the Vijaynagara and Bahamani kingdoms.
6. Discuss the salient features of Sultanate Architecture.

JHARGRAM RAJ COLLEGE

Department of History

B.A. Honours Internal Examination 2022 (under CBCS)

3rd Semester

Paper: CC- 6

(The Feudal Society)

Full Marks: 10

Time: 1 Hour

Answer **any one** question: [*Write within 1000 words*] 10x1=10

1. Critically explain the Charlemagne debate.
2. Write a note on the Treaty of Verdun.
3. Discuss the features of the Cluniac Reform Movement.
4. Critically analyze the economic features of Feudalism.
5. How do you link "Chivalry" with "Romanticism"? Answer critically.
6. How do you explain the impact of the emergence of towns on Feudalism?
7. Discuss the various barbarian invasions in medieval Europe. Explain its impact on European society, religion and economy.

Jhargram Raj Collge

Department of Physics
Internal Assessment 2022
Third Semester Physics (Core Course) CBCS
Paper-CC-12T (Solid State Physics)
Full Marks -10

Attempt any **five** questions. [5X2 = 10 Marks]

1. Show that for a simple cubic lattice d_{100}: d_{110}: d_{111}= $\sqrt{6}$: $\sqrt{3}$:$\sqrt{2}$ where d_{hkl} is the separation between the adjacent (hkl) parallel planes.
2. The density of bcc iron is 7.9 g/cm^3 and its atomic weight is 56. Calculate the length of the side of the cubic unit cell and its nearest neighbor distance.
3. The first order (100) reflection angle is 18^o for a cubic crystal using X-rays of wavelength 1.54 A^0. Determine the distance between the (100) planes and the (111) planes of the crystal.
4. Explain different kinds of magnetism in solid with example.
5. What is paramagnetic Curie temperature?
6. Calculate the molar diamagnetic susceptibility of atomic hydrogen.
7. Apply Hund's rule to the ground state of a) Eu $^{3+}$ b) Yb $^{3+}$ c) Tb $^{3+}$.

Instructions:

Email the soft copy of your answer script to subhasreepradhan89@gmail.com by 5 pm 10.01.2022. Mention your name, roll no and subject code on top of the answer sheet and also in the subject of the mail.

ঝাড়গ্রাম রাজ কলেজ

দর্শন বিভাগ

Semester VI (Honours)

CC13 (Nayaya Logic & Epistemology II)

পূর্ণ মান: 10

উত্তরপত্র Name, College Roll Number, Registration Number with year অবশ্যই উল্লেখ করতে হবে।

নিচের প্রশ্নগুলোর যেকোনো পাঁচটির উত্তর দাও। ৫ x ২ =১০

১. তর্কসংগ্রহ অনুসারে অনুমতির লক্ষণ দাও।

২. ব্যাপ্তির প্রকৃতি অনুসারে অনুমান কয়টি ও কি কি?

৩. সদ হেতুর বৈশিষ্ট্য গুলি কি কি?

৪ 'পর্বত: ধুমবান বহ্নে ' - এই অনুমতির পাঁচটি অবয়ব নির্ণয় করে দেখাও।

৫. বিরুদ্ধ হেত্বাভাস উদাহরণ সহ লেখ।

৬. হেত্বাভাস নির্ণয় কর।

' শব্দ নিত্য শব্দত্বাৎ'

৭.একটি উদাহরণ সহ অর্থাপত্তি প্রমাণ বুঝিয়ে লেখ।

৮. স্বত:প্রামাণ্যবাদ কাকে বলে?

৯. আকাঙ্খা বলতে কি বোঝ?

১০. বাক্যার্থবোধের কারণগুলি লেখ।

Jhargram Raj College
Department of Botany
B.Sc. Hons. (Semester -III)
Internal Assessment- 2023
Paper: C5 T
Anatomy of Angiosperms

F.M. – 10 Time 30 min

- **Answer any five of the following questions** **2×5=10**

1. Define bordered pits.
2. What are the anomocytic stomata? Give an example.
3. How amphivasal vascular bundle differs from amphicribal vascular bundle?
4. What is quiescent centre?
5. Write the significance of periderm.
6. What is Spring wood?
7. Define tyloses.
8. Elaborate the differences between cystolith and lithocyst.

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DEPARTMENT OF MATHEMATICS

Jhargram Raj College

JHARGRAM:: 721507

Students' Enrichment Programme

Problem of the Week

Problem Posting Date: **03.03.22** Due Date: **10.03.22**

Answer Any Two of the following:

1. Let f be an infinitely differentiable function from $\mathbb{R}$ to $\mathbb{R}$. Suppose that, for some positive integer n,

$$f(1) = f(0) = f^{/}(0) = f^{//}(0) = \cdots = f^{n}(0) = 0.$$

Prove that $f^{n+1}(x) = 0$ for some x in $(0,1)$.

2. Assume that f is twice continuously differentiable function on $(0, \infty)$, $\lim_{x\to\infty} xf(x) = 0$, $\lim_{x\to\infty} xf^{//}(x) = 0$. Prove that $\lim_{x\to\infty} xf^{/}(x) = 0$.

3. Let f be a continuous function on $[0,1]$. Evaluate $\lim_{n\to\infty} \int_0^1 x^n f(x)dx$.

Brief Solution of the Problem Posted on 03.03.22

1. By Rolle's Theorem $\exists\ x_1 \in (0,1)$ such that $f'(x_1) = 0$. Hence according to the given condition and by repeated application of Rolle's Theorem will tell us that $\exists\ x \in (0, x_n) \subset (0,1)$ such that $f^{n+1}(x) = 0$.

2. By Taylor's Theorem on $[x, x+1]$ we get

   $f(x+1) = f(x) + f'(x) + \frac{1}{2}f''(\lambda)$ where $\lambda \in (x, x+1)$

   Now, consider the expression

   $xf'(x) = \frac{x}{x+1}(x+1)f(x+1) - xf(x) - \frac{1}{2}\frac{x}{\lambda}\lambda f''(\lambda)$

   By taking the limit $x \to \infty$ both side we get the result.

3. Let $\varepsilon > 0, L = \max_{x\in[0,1]}(|f(x)| + 1)$ & $0 < \delta < \min\{\frac{\varepsilon}{2L}, 1\}$

   Observe that $|\int_{1-\delta}^{1} x^n f(x)dx| \le \int_{1-\delta}^{1} |x|^n |f(x)|dx \le L\delta \le \frac{\varepsilon}{2}$

   Also $|\int_{0}^{1-\delta} x^n f(x)dx| \le \int_{0}^{1-\delta}(1-\delta)^n |f(x)|dx \le L\delta^{n+1}$

   So, $\lim_{n\to\infty} \int_0^1 x^n f(x)dx = 0$.

DEPARTMENT OF MATHEMATICS

Jhargram Raj College

JHARGRAM:: 721507

Students' Enrichment Programme

Problem of the Week

(SEM - IV)

Problem Posting Date: **24.03.22** Due Date: **31.03.22**

Any One:

1. Show that for any irrational α $\lim_{n\to\infty} \sin n\alpha\pi$ does not exist.

2. Let α be irrational. Show that $A = \{m + n\alpha : m, n \in \mathbb{Z}\}$ is dense in $\mathbb{R}$.

3. Given a real number α and $x \in (0,1)$, calculate $\lim_{n\to\infty} n^{\alpha} x^{n}$.

……

Brief Solution of the Problem Posted on 24.03.22

1. If $\lim_{n\to\infty} \sin n\alpha\pi$ exists, then $\lim_{n\to\infty} \sin(n+2)\alpha\pi$ exists. It will imply that $\lim_{n\to\infty} (\sin(n+2)\alpha\pi - \sin n\alpha\pi) = 0$. Hence $\lim_{n\to\infty} \cos n\alpha\pi = 0$ Similarly one can show that $\lim_{n\to\infty} \sin n\alpha\pi = 0$. But we know that $sin^2 n\alpha\pi + cos^2 n\alpha\pi = 1$ so we arrive at a contradiction.

2. We will show that in any interval (p, q) there exists at least one element of A.
   Let $\varepsilon = q - p$. We know that $\forall\ \alpha \in \mathbb{R} \setminus \mathbb{Q}\ \exists\ p_n\ , q_n \in \mathbb{N}$ such that $|\alpha - \frac{p_n}{q_n}| < \frac{1}{{q_n}^2}$ Since $\alpha \in \mathbb{R} \setminus \mathbb{Q}\ \lim_{n\to\infty} q_n = \infty$ so $|q_n\alpha - p_n| < \frac{1}{q_n} < \varepsilon$ for almost all n. Set $a = |q_n\alpha - p_n|\ , ma\ \in (p, q), m \in\ \mathbb{Z}$.

3. $\alpha\ \in\ \mathbb{R},\ x \in (0,1)$. Now $\lim_{n\to\infty} \frac{(n+1)^\alpha x^{n+1}}{n^\alpha x^n} = \lim_{n\to\infty} x(1+\frac{1}{n})^\alpha = x < 1$. Hence the $\lim_{n\to\infty} n^\alpha x^n = 0$.

DEPARTMENT OF MATHEMATICS

Jhargram Raj College

JHARGRAM:: 721507

Students' Enrichment Programme

Problem of the Week

(SEM - VI)

Problem Posting Date: **24.03.22** Due Date: **31.03.22**

Any One:

1. Let $f_1, f_2, \dots, f_n$ be continuous real valued functions on $[a, b]$. Show that the set $\{f_1, f_2, \dots, f_n\}$ is linearly dependent on $[a, b]$ if and only if

$$\det\left(\int_a^b f_i(x) f_j(x) dx\right) = 0$$

2. Let α & β be real numbers such that the subgroup Γ of $(\mathbb{R}, +)$ generated by α & β is a closed set. Prove that α & β are linearly dependent over $\mathbb{Q}$.

……..

Brief Solution of the Problem Posted on 24.03.22

1. Claim: $0 \notin \Gamma'^{/}$
   If $0 \in \Gamma'^{/}$ and Γ contains all integer multiples of its elements so Γ is dense in $\mathbb{R}$. But then $\Gamma' = \mathbb{R}$, since Γ' is closed in $\mathbb{R}$. But it is not possible as Γ is countable. So $0 \notin \Gamma'^{/}$. It implies $\exists\, \gamma > 0, \gamma \in \Gamma$. If $x \in \Gamma'$ & n is the largest integer such that $n\gamma \leq x\ then\ x - n\gamma \in \Gamma'$ & $0 < x - n\gamma < \gamma$ hence $x - n\gamma = 0$.

2. Let $G = G_{ij} = \int_a^b f_i(x) f_j(x) dx$. If $\det G = 0$ then G is singular. Let a be a non- zero n-vector with
   $Ga = 0\ then\ a^T Ga = 0 = \sum_{i=1}^n \sum_{j=1}^n \int_a^b a_i f_i(x) a_j f_j(x)\, dx =$
   $\int_a^b (\sum_{i=1}^n a_i f_i(x))^2\, dx$
   Hence the set is linearly dependent.

   The other part is an easy calculation.

Jhargram Raj College

Assignment-1
3^{rd} semester Physics Honours
Paper : **CC-5**

✍ Kronecker's method of integration.

$$\int g(x)f(x)dx = g(x)F_1(x) - g'(x)F_2(x) + g''(x)F_3(x) + \cdots \quad (1)$$

1. Sketch the periodic extension of $f(t) = t/\pi$, $-\pi < t < \pi$. Find its Fourier series.

2. Sketch the periodic extension of $f(t) = 0$ for $t < 0$, $f(t) = 1$ for $t > 0$, if the funcdamental interval is $(-1, 1)$.

3. A function $f(x)$ is defined only over the range $0 < t < 4$ as

$$f(x) = \begin{cases} t, & 0 < t < 2 \\ 4 - t & 2 < t < 4 \end{cases} \quad (2)$$

Find the half range cosine and sine expansion of $f(x)$.

4. Obtain a Fourier series to represent the function

$$f(x) = |x| \quad for \quad -\pi < x < \pi \quad (3)$$

and hence deduce $\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$

5. A periodic square wave has a period 4. The function generating the square is

$$f(t) = \begin{cases} 0 & for \quad -2 < t < -1 \\ k & for \quad -1 < t < 1 \\ 0 & for \quad 1 < t < 2 \end{cases} \quad (4)$$

Find the Fourier series of the function.

6. If the Fourier series for $f(x)$ converges uniformly in $(-l, l)$, then show that

$$\frac{1}{l}\int_l^l \{f(x)\}^2 dx = \frac{a_0^2}{2} + \sum_{n=1}^{\infty}\left(a_n^2 + b_n^2\right)$$

where a_0, a_n, b_n are the Fourier's constants.

7. Find the Fourier series of the function $f(x)$in the interval $-\pi < x < \pi$, where

$$f(x) = \begin{cases} 0 & when \quad -\pi < x \leq 0 \\ \dfrac{\pi x}{4} & when \quad 0 < x < \pi \end{cases}$$

and hence show that

$$\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$$

8. Show that the function $f(x) = x^3 - \pi^2 x$ has the Fourier series

$$f(x) = \sum_{n=1}^{\infty} \frac{12(-1)^n}{n^3} \sin nx \quad (5)$$

Now show that $\sum_1^{\infty} \frac{1}{n^6} = \frac{\pi^6}{945}$

Jhargram Raj College

Problem Set - Special Functions

Code: Sem_3_Assignment_2

Batch: Semester_3, 2022 – 23

-by S.S

1. Show that

   (a)
   $$\int_0^1 \frac{x^{m-1}(1-x)^{n-1}}{(a+x)^{m+n}}\,dx = \frac{\Gamma(m)\Gamma(n)}{a^n(1+a)^m\Gamma(m+n)}$$

   (b)
   $$\int_0^1 \left(\ln\frac{1}{y}\right)^{n-1} dy = \Gamma(n)$$

   (c)
   $$\frac{1}{n}\int_0^\infty e^{-x^{1/n}}\,dx = \Gamma(n)$$

   (d)
   $$\int_0^1 \frac{dx}{\sqrt{1-x^n}} = \frac{\Gamma\left(\frac{1}{n}\right)}{\Gamma\left(\frac{1}{2}+\frac{1}{n}\right)}\frac{\sqrt{\pi}}{n}$$

   (e) $\Gamma\left(n+\frac{1}{2}\right) = \frac{1.3.5\cdot(2n-1)\sqrt{\pi}}{2^n}$

   (f)
   $$\int_0^{\pi/2}\sqrt{\tan\theta}\,d\theta = \frac{1}{2}\Gamma\left(\frac{1}{4}\right)\Gamma\left(\frac{3}{4}\right)$$

   (g) $2.5.8...(3n-1) = 3n\frac{\Gamma\left(n+\frac{2}{3}\right)}{\Gamma\left(\frac{2}{3}\right)}$

2. Prove that $\beta(p,q) = \beta(q,p)$

3. Show that
   $$\int_0^1 \frac{x^{p-1}+x^{q-1}}{(1+x)^{p+q}}\,dx = \beta(p,q)$$

4. Show that
   $$\int_0^{\pi/2}\sin^p\theta\cos^q\theta\,d\theta = \frac{\Gamma\left(\frac{p+1}{2}\right)\Gamma\left(\frac{q+1}{2}\right)}{2\Gamma\left(\frac{p+q+2}{2}\right)}$$

5. Assuming $\Gamma(n)\Gamma(1-n) = \frac{\pi}{\sin n\pi}$ for $0 < n < 1$, show that
   $$\int_0^\infty \frac{x^{p-1}}{1+x}\,dx = \frac{\pi}{\sin p\pi}$$

6. (a) Show clearly that
   $$\int_0^1 x^{m-1}(1-x^n)^{p-1}\,dx = \frac{1}{n}\beta\left(\frac{m}{n},p\right)$$
   where $n \neq 0$

   (b) Hence, find the exact value of
   $$\int_0^1 x^5(1-x^3)^2\,dx$$

7. Show that
   $$\int_0^1 \left(1-x^{1/3}\right)^{1/11} dx = \frac{1331}{1564}$$

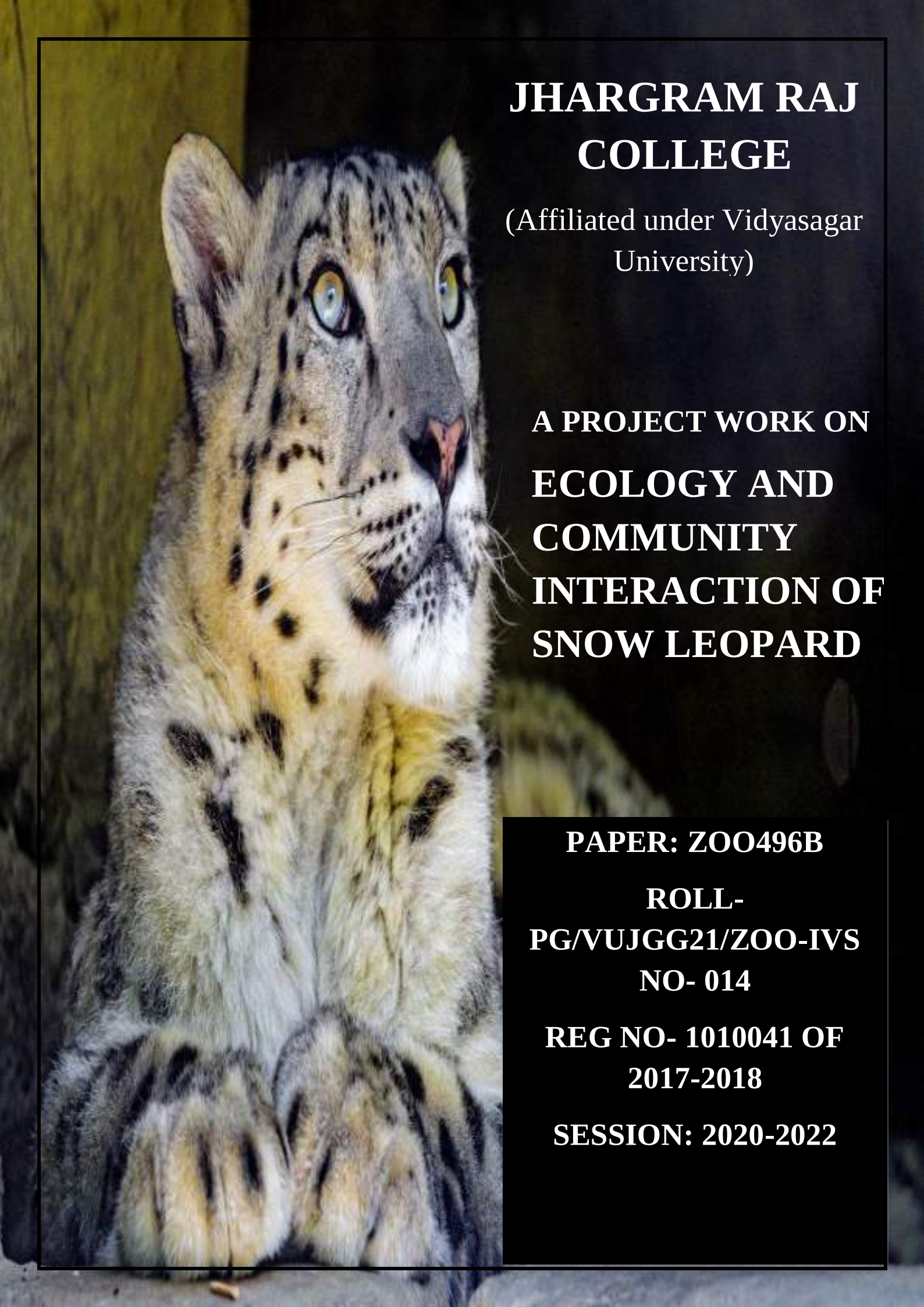
8. Show that
   $$I_n = \int_0^1 \left(1-\sqrt{x}\right)^n = \frac{2}{(n+1)(n+2)}$$

9. Show that
   $$\int_0^a \sqrt{x}\sqrt{a-x}\,dx = \frac{\pi a^2}{8}$$

10. Suppose $I_{m,n} = \int_0^{\pi/2}\sin^m\theta\cos^n\theta\,d\theta$, where $m \in \mathbb{N}, n \in \mathbb{N}$

    (a) Show that $I_{m,n} = \frac{m-1}{m+n}I_{m-2,n}$

    (b) Hence, show further that
    $$\beta(m,n) = \frac{(m-1)(n-1)}{(m+n-1)(m+n-2)}\beta(m-1,n-1)$$



JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

A PROJECT WORK ON

ECOLOGY AND COMMUNITY INTERACTION OF SNOW LEOPARD

PAPER: ZOO496B

ROLL- PG/VUJGG21/ZOO-IVS NO- 014

REG NO- 1010041 OF 2017-2018

SESSION: 2020-2022

ECOLOGY AND COMMUNITY INTERACTION OF SNOW LEOPARD

Submitted by:

AVIJIT MONDAL

Roll- PG/VUJGG21/ZOO-IVS No- 014

REG NO- 1010041 OF 2017-2018

Department of Zoology

Jhargram Raj College

Jhargram, 721507

Under the guidance of

Dr.Krishnendu Sinha

Assistant Professor of Department of Zoology

The Project is submitted for the partial fulfilment of M.Sc. degree in Zoology, Vidyasagar University

2022

Declaration by student

I do hereby that present Project entitled **"Ecology and community interaction of snow leopard"**has been carried out by me in the Department of Zoology, Jhargram Raj College, Jhargram, under the guidance of Dr. Krishnendu Sinha, Assistant Professor of Jhargram Raj College and no part there of has been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

Avijit Mondal

सत्यमेव जयते

Post Graduate Department of Zoology

Jhargram Raj College

(Government of West Bengal)

Jhargram, 721507

To whom it may concern

This is to certify that the Project work entitled **"Ecology and community interaction of snow leopard"** has been carried out by Avijit Mondal student of M.Sc. (Semester IV), Department of Zoology, Jhargram Raj College under my/our guidance for the partial fulfilment of M.Sc. 4th Semester Examination, 2022, under Vidyasagar University. The work has not been published or presented for any purpose according to my/our knowledge.

3/8/22

Krishnendu Sinha (W.B.E.S)
Assistant Professor in Zoology
Jhargram Raj College
Government of West Bengal

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I, **AvijitMondal** express my sincere regards and gratitude to Dr.Krishnendu Sinha, Assistant Professor of Zoology, Jhargram Raj College, Jhargram, for his valuable suggestions, support and guidance throughout the work.

I convey my sincere gratitude to our Principal, Dr.Debnarayan Roy, WBSES, and Associate Professor and Head of Zoology Department, Dr. Rahul Kumar Datta, for providing me the infrastructure, facility and guidance to complete my degree.

Last but not least, I am thankful to each and every member of my department, who directly as well as indirectly helped me in completing this project by their constant support.

We have availed the facilities provided by the DBT-STAR Scheme 2019-2020

Department of Biotechnology. Govt. of India

CONTENTS

ABSTRACT

The snow leopard is a felid, highly adapted to the cold and rugged mountain ecosystems where it lives. Distributed across the mountains of 12 Central Asian countries, about 4,000–7,000 snow leopards survive today and their population is believed to be declining. Due to the harsh terrain it inhabits, it has been little studied and basic ecological and biological information about the species is still unavailable.Various ongoing research projects using satellite telemetry, digital camera trapping, genetic data analysis, and other cutting-edge methods continue to help better understand snow leopard ecology. Snow leopards are solitary, although social interactions between males and females occasionally occur. Cubs follow their mother for about a year before weaning. Snow leopards have large home ranges, covering several hundred square kilometers. They prey primarily on ibex and varal, although also eat a large variety of other mountain mammals and birds, including domestic animals. Snow leopards communicate primarily through scent, although vocalizations are often heard during known mating seasons. Found in extremely low densities, their populations are increasingly threatened by mining, poaching and retaliatory killings by local herders. Various successful conservation models exist and are being implemented with variable success rates across the snow leopard distribution range. Given the extent of interface with humans, community-based conservation has proven to be the most successful in snow leopards to benefit communities and wildlife.

CONCLUSIONS

This study has taken a attempt to describe the ecology and community interaction of snow leopard, and their relationship with pray. they are largely threatened due to the extinction of natural prey species, retaliatory killing in response to human conflict, and the illegal trade of its fur and bones. Therefore we need to raise awareness about them .So we can protect them from going extinct.

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JHARGRAM RAJ COLLEGE

(Affiliated under Vidyasagar University)

A PROJECT WORK ON

Ecological importance of fishing cat

PAPER: ZOO496B

ROLL- PG/VUJGG21/ZOO-IVS NO- 023

REG NO- 2017-667 OF 2017-2018

SESSION: 2020-2022

Ecological Importance Of Fishing Cat

Submitted by

Name: Sujay Bera

Roll-PG/VUJGG21/ZOO-IVS No-023

Regn No-2017-667 of 2017-2018

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Under the guidance of

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Smt. Sanchita Pan

SACT

Jhargram Raj College

This Project is submitted for the partial fulfilment of M.Sc. degree in Zoology, Vidyasagar University

2022

Declaration by student

I do hereby declare that the present Project entitled "**Ecological Importance Of Fishing Cat**" has been carried out by me in the Department of Zoology, Jhargram Raj College, Jhargram, under the guidance of Dr. Debnarayan Roy,Pricipal & Smt. Sanchita Pan,SACT Jhargram Raj College and no part thereof has been submitted for any degree or diploma in any University, and not has been published earlier in anywhere.

Sujoy Bera
26/06/2022

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To whom it may concern

This is to certify that the Project work entitled **"Ecological importance of fishing cat"**has been carried out by Sujay Bera student of M.Sc. (Semester IV), Department of Zoology, Jhargram Raj College under my/our guidance for the partial fulfilment of M.Sc. 4th Semester Examination, 2022, under Vidyasagar University. The work has not been published or presented for any purpose according to my/our knowledge.

26/08/2022

Signature

Date

26/8/2022.

Signature

Date

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I acknowledge my indebtedness to Dr.Debnarayan Roy, Principal of Jhargram Raj College for giving me the scope to present this review.

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I would like to thanks all of my friends who help me in various ways to carry out my review work successfully.

It is impossible for me to work without the benevolence and blessing of my parents who always supported me in achieving my goals.

We have availed the facility provided by the DBT-STAR Scheme,2019-2022
Department of Biotechnology,Govt. of India.

CONTENT

Ecological Importance of Fishing Cat

ABSTRACT

The Fishing Cat *Prionailurus viverrinus* (Nikolai Severtzov and Turner Bennett)is a flagship species in their natural habitat. They have different names in different region, like “katas” and “mechobiral”.They indicate the health of their surrounding ecosystem.The Fishing Cat distribution is restricted to the coastal zone, from mangrove to swamps to river basin surrounded by rice fields, aquaculture farms and human establishment. Human interaction due to its loss of natural prey, often get them killed because they sometimes prey on livestock and cattle. They are key species in the wetland and mangrove ecosystem so community awareness of this species’ conservation is vital,because most of its natural habitats fall outside protected areas and are near human habitation. Their conservation need is important for us also, because they stabilize the wetland ecosystem and wetland ecosystem is a major source of fresh water.They host different type of biodiversity**.**So fishing cats are needed to be protected.

Conclusion

This study has taken a attempt to describe the ecology and importance of fishing cat to preserve the mangrove and wetland ecosystem,also the overall well-being of those ecosystem.We humans also benefit from their presence.

They can be found in wide range of habitats in the globe.But fishing cats are the least studied family of cats.This is why they often get killed by people.Therefore we need to raise awareness about them.So we can protect them from going extinct.

In Jungle Mahal area,it is very much important to conserve the fishing cat properly.Actually the rural people has a very little knowledge about the biology of the fishing cat.They also hurt them so, comparative awareness is very much needed for saving the fishing cat in the area.

References

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