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internships (Data for the latest completed academic year)**

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OF STUDENTS UNDERTAKING PROJECT
WORK/FIELD WORK/ INTERNSHIPS**

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Muaji

Co-ordinator, IQAC
Kabi Jagadram Roy Government
General Degree College
Mejia, Bankura PIN-722143



afsh

Officer-in-Charge
Kabi Jagadram Roy Govt. General Degree College
Mejia-722143 Dist-Bankura, W.B.



Field Work by Department of Geology

- i. Highlighted part of syllabus**
- ii. Departmental notice**
- iii. Movement order**
- iv. Certified list of students**
- v. Sample project report**
- vi. Sample Certificate issued by HOI**



i. Highlighted part of syllabus

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Bankura University

B.Sc. Geology (Honours) CBCS w.e.f. 2022-23

2. Scheme for CBCS Curriculum

2.1 Credit distribution across courses

Course Type	Total Papers	Credits	
		Theory + Practical	Theory + Tutorial ⁺
Core Courses (CC)	14	14*4 = 56 + 14*2 = 28	14*5 = 70 14*1 = 14
Discipline Specific Elective (DSE)	4	4*4 = 16 + 4*2 = 8	4*5 = 20 4*1 = 4
Generic Elective (GE)	4	4*4 = 16 + 4*2 = 8	4*5 = 20 4*1 = 4
Ability Enhancement Course (AECC)	1	1*4 = 4	1*4 = 4
	1	1*2 = 2	1*2 = 2
Skill Enhancement Course (SEC)	4	2*2 = 4	2*2 = 4
Total	26	142	142

+Tutorials of 1 Credit will be conducted in case there is no practical component

2.2 CBCS Curriculum for B. Sc. Honours in Geology

(A) Generalised Semester-wise course structure

YEAR	SEMESTER	CORE COURSE (CC) (14)	ABILITY ENHANCEMENT COURSE (AECC) (2)	SKILL ENHANCEMENT COURSE (SEC) (2)	DISCIPLINE SPECIFIC ELECTIVE (DSE) (4)	GENERIC ELECTIVE (GE) (4)
FIRST YEAR	I	1. EARTH SYSTEM SCIENCE 2. MINERAL SCIENCE	ENVIRONMENTAL STUDIES			GE-1
	II	3. ELEMENTS OF GEOCHEMISTRY 4. STRUCTURAL GEOLOGY	COMMUNICATIVE ENGLISH/HINDI/MIL			GE-2
SECOND YEAR	III	5. IGNEOUS PETROLOGY 6. SEDIMENTOLOGY		SEC-I (Field Geology)		GE-3
	IV	7. PALEONTOLOGY 8. METAMORPHIC PETROLOGY 9. PRINCIPLES OF STRATIGRAPHY AND PRECAMBRIAN STRATIGRAPHY OF INDIA 10. PHANEROZOIC STRATIGRAPHY OF INDIA		SEC-II (Field Geology)		GE-4
THIRD YEAR	V	11. HYDROGEOLOGY 12. ECONOMIC GEOLOGY			DSE - 1 DSE - 2	
	VI	13. GEOMORPHO-LOGY, REMOTE SENSING & GIS 14. ENGINEERING GEOLOGY			DSE - 3 DSE - 4	



Bankura University

B.Sc. Geology (Honours) CBCS w.e.f. 2022-23

SEMESTER-III

COURSE CODE	COURSE TITLE	CREDIT	MARKS			No. of hours		
			IA	ESE	TOTAL	Lec	Tu	Pr
UG/GEL/301/C-T5 & UG/ GEL /301/C-P5	Igneous Petrology	4	10	25	35	4	0	0
	Igneous Petrology Lab	2	0	15	15	0	0	4
UG/ GEL /302/C-T6 & UG/ GEL /302/C-P6	Sedimentology	4	10	25	35	4	0	0
	Sedimentology Lab	2	0	15	15	0	0	4
UG/ GEL /303/C-T7 & UG/ GEL /303/C-P7	Palaeontology	4	10	25	35	4	0	0
	Palaeontology Lab	2	0	15	15	0	0	4
*UG/ GEL /304/GE-T3 & *UG/ GEL /304/GE-P3	Earth surface processes/Physics and chemistry of earth	4	10	25	35	4	0	0
	Earth surface processes Lab /Physics and chemistry of earth Lab	2	0	15	15	0	0	4
UG/ GEL /305/SEC-1	Field Geology	2	10	40	50	0	0	4
Total		26	50	200	250			

* To be opted by the honours students of other discipline

SEMESTER-IV

COURSE CODE	COURSE TITLE	CREDIT	MARKS			No. of hours		
			IA	ESE	TOTAL	Lec	Tu	Pr
UG/GEL/401/C-T8 & UG/GEL/401/C-P8	Metamorphic Petrology	4	10	25	35	4	0	0
	Metamorphic Petrology Lab	2	0	15	15	0	0	4
UG/GEL/402/C-T9 & UG/GEL/402/C-P9	Principles of Stratigraphy and Precambrian Stratigraphy of India	4	10	25	35	4	0	0
	Prin. Strat. & Precam. Strat. India Lab	2	0	15	15	0	0	4
UG/GEL/403/C-T10 & UG/GEL/403/C-P10	Phanerozoic Stratigraphy of India	4	10	25	35	4	0	0
	Phan. Strat. of India Lab	2	0	15	15	0	0	4
*UG/GEL/404/GE-T4 & *UG/GEL/404/GE-P4	Earth resources/Natural hazards and disaster management	4	10	25	35	4	0	0
	Earth resources Lab/Natural hazards and disaster management Lab	2	0	15	15	0	0	4
UG/GEL/405/SEC-2	Field Geology	2	10	40	50	0	0	4
Total		26	50	200	250			

* To be opted by the honours students of other discipline



Bankura University

B.Sc. Geology (Honours) CBCS w.e.f. 2022-23

Unit 6: GIS in Urban Geology

1. Introduction, Application in Urban development, land use and GW Exploration.

Unit 7: Precaution from seismic hazard in Urban planning

1. Precaution from seismic hazard in Urban planning.
2. Seismic Hazards: Micro-zonations of hazard based on engineering geological features, Urban-subservice network.

Suggested Readings

- Huggenberger, P. and Eptin, J. 2011 Urban Geology: Process-Oriented Concepts for Adaptive and Integrated Resource Management. Springer
- Lollino, G. et al. (Ed.), Engineering Geology for Society and Territory. Springer

4.16 DSE P8 – Urban Geology Lab

2 Credits

List of Practical

1. Map Reading of urban areas.
2. Ground water flow direction estimation.
3. Case studies of Urban flood; Flood hydrographs.
4. Case studies of urban planning.

5. Skill Enhancement Courses

5.1 SEC P1 – Field Geology I - Basic Field Training

2 Credits

(i) Course objectives:

Students will understand how preliminary surveys are carried out especially in mining and natural resource bearing areas. They would be trained to work independently in the field of geological mapping and sampling.

(ii) Course learning outcomes:

This course is devised to provide basic knowledge of geological mapping and surveying techniques. It also will upgrade and relate the theoretical knowledge of geological aspects to field observations.

(iii) Content of the course:

Unit 1

- a. Topographic sheet: Methods of naming. Features, scale. Map reading. Clinometer and Brunton compass: Use of the instruments in measuring geological data in field.

Unit 2

1. Use of topographic sheets in field. Marking location in topographic sheet using physical features and bearing.
2. Use of GPS in field.
3. Distance, height and pace approximation in field.



Bankura University

B.Sc. Geology (Honours) CBCS w.e.f. 2022-23

Unit 3

- a. Identification of rock types.
- b. Identification of sedimentary and tectonic structures in field.

Unit 4

1. Techniques of measurement of orientation data in field.
2. Litholog preparation

Unit 5

1. Recording field data in maps and notebooks.
2. Report writing.

5.2 SEC P2 - Field Geology II - Geological Mapping and Structural Geology Field

2 Credits

(i) **Course objectives:**

Students will be expected to do the geological mapping with structural details.

(ii) **Course learning outcomes:**

This course is devised to provide details of structural mapping. It also will upgrade and relate the theoretical knowledge of geological aspects to field observations.

(iii) **Content of the course:**

Unit 1

1. Preparation of a geological map of a small area with homoclinal or gently folded beds.

Unit 2

1. Stereographic plots of orientation data and their interpretation.

5.3 SEC P3 – Field Geology III - Stratigraphy and Palaeontology-related field 2 Credits

(i) **Course objectives:**

Students will be expected to do the geological mapping in relation to stratigraphy and palaeontology

(ii) **Course learning outcomes:**

This course is devised to provide knowledge of geological mapping stratigraphy and palaeontology.

(iii) **Content of the course**

1. Study of primary sedimentary structures,
2. Study of taphonomic features,
3. Preparation of stratigraphic column of an area, etc.



ii. Departmental Notice



Government of West Bengal
KabiJagadram Roy Government General Degree College
Mejia – 722143.
Department of Geology

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West Bengal.
Phone: +91-3241-250250
E-mail: kjrggdcmejia@gmail.com
Web: www.ggdcmejia.in

No. 04/0323/ Geol-Field-KJRGGDCM

Date: 17/03/2023

NOTICE

A geological fieldwork will be conducted by the department from **21/03/2023 to 25/03/2023** in and around Mejia (Bankura District), Panchet (Purulia District) and Asansol (Pashim Burdwan District), West Bengal for the students of B. Sc 2nd year (Semester-4) and 3rd year (Semester-6) Geology Honours. The students will be accompanied by Dr. Nivedita Chakraborty and Ms. Indrani Mondal, Assistant Professor, Department of Geology.

Students are instructed to attend this compulsory (for Semester-4) field training programme. They should assemble at the department by 09.30 A.M. every day during the aforesaid period.

Each student should carry the following items for use in the field:

Sl. No.	Items
1.	Toposheet
2.	Clinometer compass
3.	Geological hammer
4.	Chisels
5.	Haver sack
6.	Hard board (10 inch x 8 inch)
7.	Diagonal Scale
8.	Microtip pen (0.5)
9.	Pencil
10.	Eraser
11.	Field note book
12.	Ball pen
13.	Streak plate
14.	Pocket Lens
15.	Magnet
16.	Marker pen (for numbering the rock samples)
17.	Cloth bags/Plastic sachets (for collecting rock samples)
18.	Pouch bag (to carry the small field equipments)
19.	Meter tape
20.	Camera
21.	Cap/Hat
22.	Tiffin
23.	Water bottle
24.	Glucon-D/Medicine (as per requirement)

*Note: Students should wear full sleeve cotton garments with trousers/jeans and field shoes.

Mujji

17/03/2023
Head
Department of Geology



iii. Movement order



Government of West Bengal
Office of the Principal
Kabi Jagadram Roy Govt. General Degree College
MEJIA – 722143.

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Phone: +91-3241-250250
E-mail: ggdcmejia@rediffmail.com
Web: www.ggdcmejia.org

No.: 043/0323/Field/Geology

Date: 10/03/2023

MOVEMENT ORDER

Dr. Nivedita Chakraborty and Ms. Indrani Mondal, Assistant Professor, Department of Geology of this College will visit different areas in and around Mejia, in Bankura District, Panchet in Purulia District and Asansol in Pashim Burdwan District, West Bengal from 21.03.2023 to 25.03.2023 in connection with the geological field work of 02 (two) students of B. Sc. 2nd year (Geology Hons.). They will carry clinometer compass, topographic and geological map, hammer, GPS and other necessary instruments for educational fieldwork. They will collect and carry rock samples (for educational purposes only) having no economic values.

This is requested to all concerned to please extend help and co-operation, if needed, to make this field work a success in both academic and public interests.




(Prof. Alope Kumar Das)
Officer-in-Charge.
Officer - in - Charge
Kabi Jagadram Roy Govt. General Degree College
Mejia - 722143, Dist - Bankura, W.B.



iv. Certified list of students



Government of West Bengal
Kabi Jagadram Roy Government General Degree College
Mejia – 722143.

Department of Geology

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West Bengal.
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Web: www.ggdmejia.in

TO WHOM IT MAY CONCERN

This is to certify that UG students of Department of Geology have successfully completed the following compulsory academic field training programmes in under mentioned academic session: -

Sl No.	Academic Session	Class	Field Duration		Field Area
			From	To	
1	2018-2019	B.Sc. 2 nd Year students	06/12/18	12/12/18	In and around Mejia, Saltora, Shushunia in Bankura (W.B.) (Vide Memo No. 120/1218/Field/Geology dated 04.12.2018)
2	2018-2019	B.Sc. 2 nd Year students	21/02/19	27/02/19	In and around Marbedya, Saltora, Shyamapur in Bankura (W.B.) (Vide Memo No. 160/0219/Field/Geology dated 19.02.2019)
3	2019-2020	B.Sc. 2 nd Year students	07/02/2020	09/02/2020	In and around Mejia and Saltora Bankura (W.B.) (Vide Memo No. 025/0220/(Vide Memo No. 043/0323/Field/Geology dated 05.02.2023)
4	2019-2020	B.Sc. 2 nd Year students	27/02/2020	07/03/2020	In and around Mejia, Bhara, Biharinath (Bankura District) and Banspetali (Purulia District), W.B. (Vide Memo No. 119/0220/Field/Geology dated 26.02.2020)
5	2021-2022	B.Sc. 2 nd & 3 rd Year students	25/03/2022	31/03/2022	In and around Mejia, Biharinath (Bankura District) and Banspetali, Madhukunda (Purulia District), W.B. (Vide Memo No. 054/0322/Field/Geology dated 16.03.2020)
6	2022-2023	B.Sc. 2 nd Year students	18/01/2023	20/01/2023	In and around Saltora, Bankura (W.B.) (Vide Memo No. 022/0123/Field/Geology dated 16.01.2023)
7	2022-2023	B.Sc. 2 nd & 3 rd Year students	21/03/2023	25/03/2023	In and around Mejia (Bankura district), Garh Panchkot (Purulia district) and Asansol (Pashim Burdwan district), W.B. (Vide Memo No. 043/0323/Field/Geology dated 10.03.2023)
8	2022-2023	B.Sc. 2 nd & 3 rd Year students	31/03/2023		Underground Mines Visit of SSI Colliery, Sripur (ECL) (Vide Memo No. 05/0323/Geol-Mine visit-KJRGDCM dated 29.03.2023)

M. A. Maji

Head
Department of Geology

Dr. ARESH KUMAR MAJI, W.B.E.S
Associate Professor of Geology
Kabi Jagadram Roy Government General Degree College
Mejia-722143, Dist-Bankura, W.B.



Government of West Bengal
Kabi Jagadram Roy Government General Degree College
Mejia – 722143.

Department of Geology

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Details of the students participating in Geological Field Work [2018-19 to 2023-24]

Geological field work in and around Mejia, Saltora, Shushunia in Bankura from 06/12/2018 to 12/12/2018			
Sl. No.	Class	Name of the Student	UID/Roll No.
1.	B.Sc. 2 nd Year (Sem-III)	Labani Karmakar	17693120001
2.		Bhajahari Bhandari	17693120003
3.		Rahul Kundu	17693120004
4.		Sourav Ghosal	17693120005
5.		Shilpa Mondal	17693120007
6.		Animesh Mondal	17693120008
7.		Moupia Mukherjee	17693120009
8.		Astik Mondal	17693120010
Geological field work in and around Marbedya, Saltora, Shyamapur in Bankura (W.B.) from 21/02/2019 to 27/02/2019			
1.	B.Sc. 2 nd Year (Sem-IV)	Labani Karmakar	17693120001
2.		Bhajahari Bhandari	17693120003
3.		Rahul Kundu	17693120004
4.		Sourav Ghosal	17693120005
5.		Shilpa Mondal	17693120007
6.		Animesh Mondal	17693120008
7.		Moupia Mukherjee	17693120009
8.		Astik Mondal	17693120010
Geological field work in and around Mejia and Saltora Bankura (W.B.) from 07/02/2020 to 09/02/2020			
1.	B.Sc. 2 nd Year (Sem-III)	Tanmoy Karmakar	18223120001
2.		Sumanta Kundu	18223120002
3.		Subhash Mondal	18223120003
Geological field work in and around Mejia, Bhara, Biharinath (Bankura District) and Banspetali (Purulia District), W.B. from 27/02/2020 to 07/03/2020			
1.	B.Sc. 2 nd Year (Sem-IV)	Tanmoy Karmakar	18223120001
2.		Sumanta Kundu	18223120002
3.		Subhash Mondal	18223120003
Geological field work in and around Mejia, Biharinath (Bankura District) and Banspetali, Madhukunda (Purulia District), W.B. from 25/03/2022 to 31/03/2022			
1.	B.Sc. 2 nd (Sem-IV) & 3 rd Year (Sem-VI)	Riya Layek	19223120001
2.		Tuhin Kundu	19223120002
3.		Nipa Sen	19223120004
4.		Saptarshi Banerjee	19223120005
5.		Arpita Pandey	19223120006
6.		Sayantan Modak	19223120007
7.		Biltu Chatterjee	19223120008
8.		Diptoman Singh	19223120009
9.		Sunanda Chowdhury	20223120002
10.		Nilavo Shit	20223120003
11.		Apurba Dey	20223120004

P.T.O.



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Kabi Jagadram Roy Government General Degree College
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Web: www.ggdcmejia.in

Geological field work in and around Saltora, Bankura (W.B.) from 18/01/2023 to 20/01/2023			
Sl. No.	Class	Name of the Student	UID/Roll No.
1.	B.Sc. 2 nd Year (Sem-III)	Sourin Maiti	2135094
2.		Sathi Layek	2135140
Geological field work in and around Mejia (Bankura district), Garh Panchkot (Purulia district) and Asansol (Pashim Burdwan district), W.B. from 21/03/2023 to 25/03/2023			
1.	B.Sc. 2 nd (Sem-IV) & 3 rd Year (Sem-VI)	Sourin Maiti	2135094
2.		Sathi Layek	2135140
3.		Apurba Dey	2035098
4.		Sunanda Chowdhury	2035131
5.		Nilavo Shit	2035096
Underground Mines Visit of SSI Colliery, Sripur (ECL) on 31/03/2023			
1.	B.Sc. 2 nd (Sem-IV) & 3 rd Year (Sem-VI)	Sourin Maiti	2135094
2.		Sathi Layek	2135140
3.		Apurba Dey	2035098
4.		Sunanda Chowdhury	2035131
5.		Nilavo Shit	2035096

Maji

10/04/2023

Head

Department of Geology

Dr. ARESH KUMAR MAJI, W.B.E.S
Associate Professor of Geology
Kabi Jagadram Roy Government General Degree College
Mejia-722143, Dist-Bankura, W.B.



v. Sample photos of field work



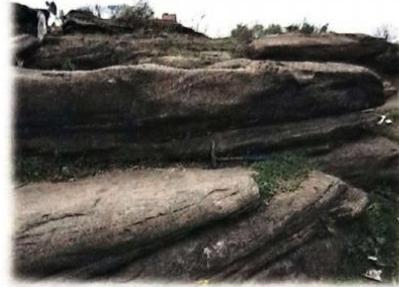




vi. Sample field report

**A REPORT ON GEOLOGICAL FIELD STUDY IN ROCKS OF BARAKAR,
BARREN MEASURES, RANIGANJ, PANCHET AND SUPRAPANCHET
FORMATION OF GONDWANA SUPER GROUP WITHIN THE RANIGANJ BASIN,
WEST BENGAL**

(2023)



SUBMITTED BY

NAME: Sathi Layek

UID: 21223120005

SEMESTER: IV

COURSE TITLE: Field Geology

COURSE ID: 42025

COURSE CODE:

Department Of Geology

Kabi Jagadram Roy Government General Degree College, Mejia, Bankura, Pin - 722143

UNDER THE SUPERVISION OF

DR. NIVEDITA CHAKRABORTY
ASSISTANT PROFESSOR

PROF. INDRANI MONDAL
ASSISTANT PROFESSOR


EXAMINED
Department of Geology
Kabi Jagadram Roy Govt. General
Degree College Centre
Mejia, Bankura



ACKNOWLEDGEMENT

During this fieldwork in different formations of the Gondwana Super Group of rocks within the Raniganj Basin, we were accompanied by some distinguished faculty members of our department. I am grateful to Dr. Nivedita Chakraborty, and Ms. Indrani Mondal for their guidance during the entire fieldwork. Their assistance and supervision helped me to successfully carry out the field work. I am thankful to both of them also for their valuable suggestions during the preparation of this field report.

I would like to express my gratitude to Dr. Asesh Kumar Maji, Associate Professor and Head, Department of Geology for his encouragement and official support.

I am grateful to Department of Geology and KJRGDC for the infrastructural support.

I am thankful to *Achintyada* (our responsible driver) for making our journey to and from Mejia, quick & easy.

I express my thankfulness to my accompanying batch mates and seniors, for making this field excursion such a memorable experience for all of us.

Finally, I would also like to thank my parents for their support, appreciation, encouragement and been interested in my academic achievements.

Sathi Layek
29/03/2023



CONTENT

Sl No.	Topic	Page No.
1.	GENERAL INTRODUCTION <ul style="list-style-type: none">▪ Introduction▪ Location and accessibility▪ vegetation and climate▪ Physiography and drainage▪ Objectives of the present work	4-6
2.	GEOLOGICAL BACKGROUND <ul style="list-style-type: none">▪ Regional geology▪ Stratigraphy▪ Regional structure▪ Tectonic setup▪ Basin configuration	8-12
3.	Study of Gondwana Rocks <ul style="list-style-type: none">3.1 Barakar Formation3.2 Barren Measures3.3 Raniganj Formation3.4 Panchet Formation3.5 Suprapanchet Formation	13-23
4.	Visit to Archaeological Site at Garh Panchokot	24
5.	Discussion and Conclusion	25-28
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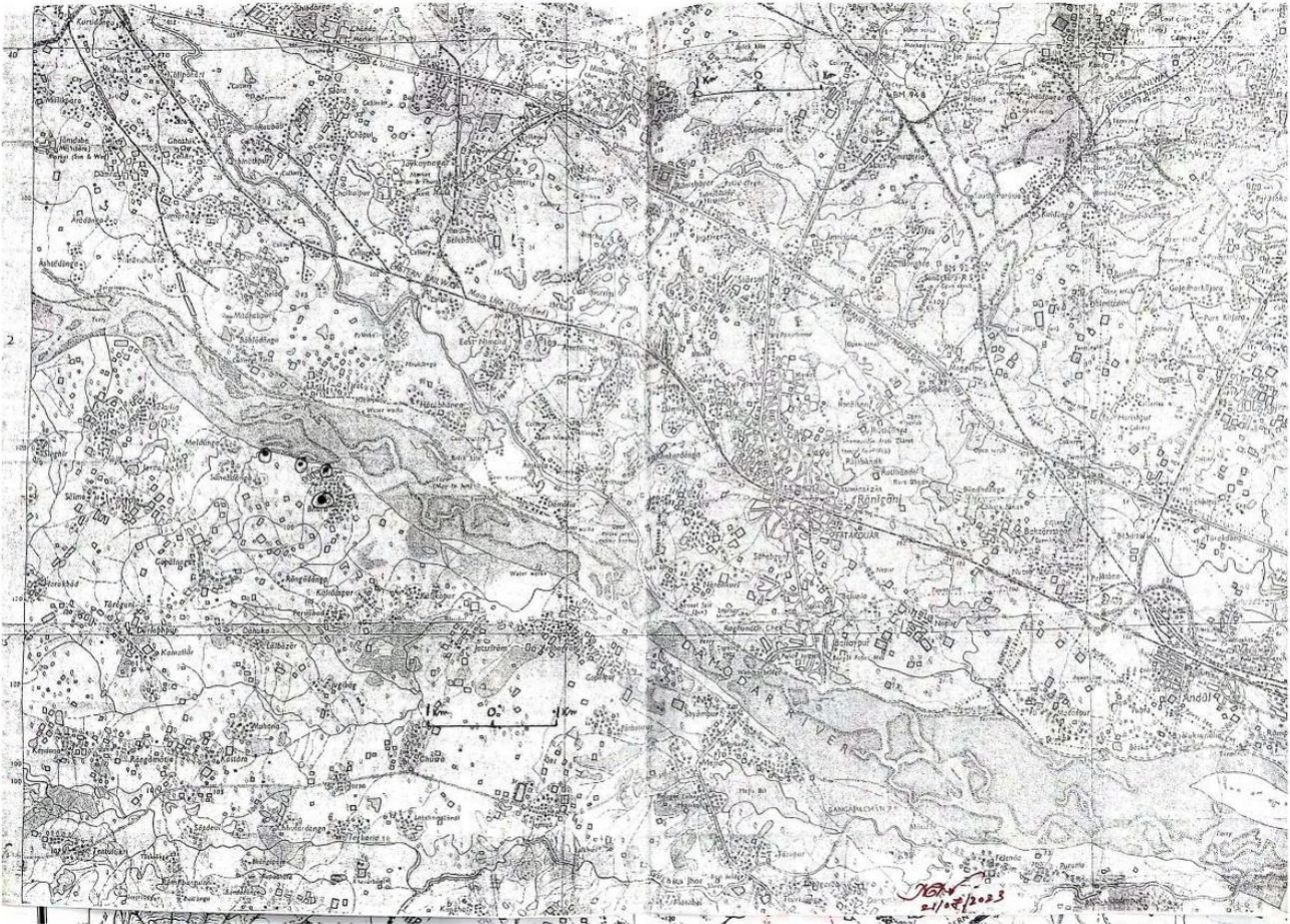


GENERAL INTRODUCTION



INTRODUCTION

After the uplift of Vindhya, the Peninsula witnessed no further deposit, a new cycle of sedimentation started and interconnected inland basins of fluvial and lacustrine origin with glacial deposits at base. This new phase of sediment deposits at the continental blocks continued at the lower cretaceous representing time span 180 Ma. The sediments thickness is 6-7km thick and occupy the tracts in the Peninsula and constitute Gondwana Supergroups. The Gondwana Basins are wider and the rocks have been preserved in faulted part of the grabens. The term Gondwana was coined by H.B. Medicott in 1872. It was derived from the Kingdom of Gonds, an ancient tribe of central India. This tribe still exist in the state of Madhya Pradesh. The term supergroup is used here for its stratigraphical hierarchy as it contains several groups and formation. Gondwana term is also used in a tectonostratigraphic manner – The Supercontinent of the Gondwanaland. This supercontinent existed between Permian to Cretaceous period as southern half of Pangea.





LOCATION AND ACCESSIBILITY

The Raniganj Basin is a geological basin located in the state of West Bengal, India. It is part of the Gondwana Supergroup, which is a group of sedimentary rocks that were deposited during the Permian and Triassic periods. The area under investigation is surroundings of Chirkunda, Iron stone shale, Bhara and Panchet hill roads. The other localities mentioned on the toposheet (no. ^{34 and}) are connected to the main road by metallic, non-metallic roads and foot tracks.

FORMATION	LOCATION	LATITUDE	LONGITUDE
Barakar Formation	At the bank of river Barakar (near Chirkunda)	23°46'52.32''	86°48'26.21''
Barren-Measure Formation (Iron-stone Shale)	At the bank of river Barakar	23°43'46.03''	86°48'24.34''
Raniganj Formation	Bhara,	23°36'30.92''	87°02'25.87''
	Shyamapur (Mejia)		
Panchet Formation	Harmadih		
	Base of Panchet Hill	23°35'43.43''	86°44'25.80''
	Sonori		
Supra-Panchet Formation	Middle part of Panchet Hill		
	Biharinath Hill		
	Baranti Hill		

VEGETATION AND CLIMATE

The major crops of the area are wheat, paddy, sugarcane etc. Mainly dry climate prevails in most part of the year. The temperature recorded during the field was around 45.0°C.



PHYSIOGRAPHY AND DRAINAGE

Most part of the has a gently undulating topography of the average height ranging between 140m and 180m above MSL. Panchet Hill is located in Neturia at the north-eastern end of Purulia district, in the Indian state of West Bengal. It is a small hill with an elevation of 490 meters (1,607 feet). The hill is part of the Chota Nagpur Plateau, and it is surrounded by a number of other hills, including the Ajodhya Hills and the Dalma Hills. Several nalas and streams in the eastern and western parts of the area follow tortuous courses showing dendritic drainage pattern. All the streams in the eastern and northeastern part flow northward to meet the Barakar River. However, the streams in southwest flow towards south. These rivers provide water for irrigation and drinking purposes in the area.

OBJECTIVES OF THE PRESENT WORK

The present study aims the following objectives :

- To identify rocks and minerals in their natural surroundings.
- To map the different formations and their boundaries.
- To describe the lithology (physical characteristics) of the rocks.
- To identify fossils and other sedimentary features.
- To determine the depositional environment of the rocks.
- To investigate the relationship between the different formations.
- To assess the potential for mineral resources, such as coal.
- To improve our understanding of the geology of the Raniganj Basin.
- To contribute to the scientific understanding of the Gondwana Supergroup.



GEOLOGICAL BACKGROUND



REGIONAL GEOLOGY

Raniganj coalfield is the easternmost member of the Damodar- Koel valley basin belt. It has the distinction of being the birth place of the Indian coal mining industry. Official record on occurrence and extraction of coal in Raniganj Coalfield dates back to 1774.

Geological survey, mapping, exploration and exploitation over the last 200 years or so have well defined the northern, western and southern boundaries of this coalfield. The eastern boundary, which is concealed below younger rocks, remains a matter of conjecture till late eighties of the last century when sub-surface exploration, aided by geophysical survey, led to the delineation of eastern limit of the coalfield along E 87030' i.e., to east of Panagarh-Domra area. The earlier known limit was up to E 87020' longitudes. The Raniganj Coalfield, as of now, has a total spread of over 1900 sq. km. and its limits are bounded by the latitudes 23022' and 23052'N and longitudes 86036' and 87030'E. Geographically, major portion (about 1883 sq. km) of the coalfield area is located in the state of West Bengal, only a small northwestern part of the area spills over to the state of Jharkhand.

In West Bengal, Raniganj coalfield covers part of Bardhaman (1506 sq. km.), Birbhum (143 sq. km.), Bankura (125 sq. km.) and Purulia (108 sq. km.) districts while in the state of Jharkhand it covers part of Dhanbad (60 sq. km.) and SanthalParganas (12 sq. km.)

In the Gondwana Coalfields of India, Barakar Formation (Early Permian) is the main repository of coal. Raniganj Coalfield is unique for prolific development of coal in both the Barakar and Raniganj Formations, the coal seams from the latter contributing to more than two-thirds (67%) of the total coal resources in Raniganj basin. Till date, Raniganj coalfield is practically the sole repository of superior quality, high volatile non-coking coal, the source of which is scanty in this country. Occurrence of 3 lignite seams, at depths beyond 200m, has been reported in the basal part of the Tertiary sequence from the eastern fringe of the coalfield. The seams have been interpreted as discontinuous lensoid bodies varying from 0.79m to 7.30m in thickness.

STRATIGRAPHY

✦ Barakar Formation:

- ✦ The Talchir sediments are succeeded by a thick sequence of coal, which has been designated as Barakar Formation. The existence of the Karharbari Formation, however, is not very well established in Raniganj coalfield. Gee (1932), however, opined that the Karharbari rocks should be considered as a basal **member** of the Barakar Formation.



- ✚ The Barakar Formation covers a large east-west trending tract in the northern part of the coalfield. It shows a progressive decrease in thickness towards the eastern and southeastern parts of the coalfield.
- ✚ **Ironstone Shale/Barren Measures :**
- ✚ The Barren Measures Formation in the Raniganj Coalfield overlaps with the Barakar Formation. The two formations are overlapped by a series of rock beds known
- ✚ 'Ironstone Shale or Kulti formation' and 'Raniganj Barakar'. The Barren Measures is a monotonous sequence of dark grey and black shale with numerous beds of ironstone. The formation has considerable thickness of around 600m in the western part of the basin and shows a decrease in thickness eastwardly. It is completely devoid of carbonaceous horizon.
- ✚ **Raniganj Formation:**
- ✚ Raniganj Coalfield stands apart from the other Indian Gondwana basins in regard to the proliferation of workable coal seams in both the coal measures--Barakar and Raniganj. Reserves of coal from the latter far exceed that from the former mainly because of the spread of the Raniganj Formation over a vast areal stretch. Development of multitude of coal seams varying in space and time and exhibiting complicated splitting - coalescing pattern makes this formation a unique study area. Deciphering the developmental pattern and correlation of coal seams from one extremity of the basin to the other has remained an enigmatic problem for the coal geologists over the years. In-depth analyses of data on vertical organization and lithofacies variation in space and time of Raniganj Formation generated through exploratory activities in recent years point to the need for updating the earlier ideas on developmental pattern of the coal seams. The thickness of Raniganj Formation is maximum in the western part of the coalfield and decreases eastwards. Coal seams, however, are much thicker in the east showing splitting tendency towards west. The coal seams can be clubbed into seven groups such that no member seam of one group merges with a member seam of another group anywhere in the basin. These groups of coal seams, or coal horizons, have been named RN-1 to RN-7 in ascending order of sequence.
- ✚ **Panchet Formation**
- ✚ Overlying the Raniganj Formation is a thick sequence of strata of about 600m thickness which have been grouped as the Panchet Formation. This formation occupies a major area in the south-eastern part and extends to the southern margin of the basin. The transition from Raniganj formation to Panchet formation is usually marked by a bed of red clay.
- ✚ In the central & southern part Panchet Formation is represented by khaki green & yellow brown sediments and an upper Hirapur member having yellow, grey, micaceous sandstone & red clay. The members derive their names from the type areas located near the Panchet hill in the south-western part of the coalfield.



✦ The clear delineation of Panchet-Raniganj boundary has assumed considerable significance in the context of defining the Permo-Triassic boundary in the Gondwana succession.

✦ **Supra Panchet Formation**

✦ Coarse, pebbly ferruginous quartz arenite with subordinate amount of clays, resting unconformably over the Panchet formation, crop out at places along the southern margin of the coalfield. These beds, grouped under Supra Panchet, occur at Panchet and Biharinath hills. The Supra-Panchet rocks are equivalent to Durgapur beds exposed in Durgapur area in the eastern part of the coalfield.

REGIONAL STRUCTURE

The regional structure of the Raniganj Basin is characterized by a series of faults and folds. The faults are responsible for the horst and graben structures that are common in the basin. The folds are typically anticlines and synclines. The regional structure of the basin is thought to have been formed as a result of the collision of the Indian and Asian plates during the Cenozoic Era.

The geological field study of the rocks in the Raniganj Basin can provide valuable information about the regional structure of the basin. This information can be used to help with the exploration and development of the basin's mineral resources, as well as to improve our understanding of the geology of the region.

TECTONIC SETUP

The tectonic setup of the Raniganj Basin can be divided into two phases:

Phase 1: The first phase of tectonic activity occurred during the Permian period. During this phase, the basin formed as a result of rifting between the Indian and Antarctic plates. The rifting caused the deposition of the Talchir Formation, which is composed of glacial and fluvial deposits.

Phase 2: The second phase of tectonic activity occurred during the Triassic period. During this phase, the rifting ceased and the basin began to subside. This subsidence caused the deposition of the Barakar, Barren Measures, Raniganj, and Panchet formations, which are all composed of fluvial and lacustrine deposits.

The tectonic setup of the Raniganj Basin has had a significant impact on the distribution of its mineral resources. The Barakar Formation, which is the most important formation in the basin, contains the majority of the coal reserves. The coal seams in the Barakar Formation are



thick and continuous, which makes them ideal for mining. The other formations in the Raniganj Basin also contain mineral resources, such as iron ore, limestone, and dolomite.

Some of the key tectonic features that can be observed in the field:

- **Rift valleys:** The Raniganj Basin is a rift basin, which means that it formed as a result of rifting between two tectonic plates. The rift valleys that formed during this process can be seen in the field, and they are filled with sediments from the different formations in the basin.
- **Faults:** Faults are fractures in the Earth's crust that can cause the rocks on either side of the fault to move relative to each other. Faults are common in rift basins, and they can be seen in the field in the Raniganj Basin.
- **Folds:** Folds are bends in the Earth's crust that can be caused by tectonic forces. Folds are also common in rift basins, and they can be seen in the field in the Raniganj Basin.
- **Unconformities:** Unconformities are surfaces in the rock record that represent a period of time when no sediment was deposited. Unconformities can be seen in the field in the Raniganj Basin, and they can provide information about the tectonic history of the basin.

Basin Configuration: The basin configuration of the Raniganj Basin is complex and has been the subject of much study. The basin is thought to have formed as a result of rifting during the Permian period. The rifting caused the crust to thin and subside, allowing for the deposition of the sedimentary rocks in the basin. The basin configuration of the Raniganj Basin has had a significant impact on the distribution of the coal reserves in the basin. The coal seams are typically thickest in the central part of the basin, where the subsidence was greatest. The coal seams are also typically thicker in the areas that are bounded by faults, as these areas were more protected from erosion.

The basin is elongated in a north-south direction, with a length of about 300 kilometers and a width of about 100 kilometres.

The basin is located at an elevation of about 200 meters above sea level.

The basin is bounded by a number of faults, including the Raniganj Fault, the Barakar Fault, and the Panchet Fault.

The basin is filled with about 5,000 meters of sedimentary rocks.

The coal seams in the Raniganj Basin are typically thickest in the central part of the basin, where the subsidence was greatest.

Basin Configuration

The Raniganj coalfield extends from near Nirsa in the west to Domra /Galsi on the east, for a length of about 92 km. It has attained a maximum width of about 32 km near Nimcha. The total spread of the Raniganj Coalfield, as of now, is over 1900 sq. km. The geophysical surveys in the Raniganj coalfield have given a broad idea of the basement configuration and the thickness of the sedimentary pile. It has suggested presence of two interconnected sub-basins viz. the Asansol and Ichhapur sub-basins with a sediment cover of about 2.1 km and 2.8 km respectively and a ridge like structure through Andal separating the above two basins. Notwithstanding to this observation, the basement contour profiles drawn on the basis of sub-surface data show a progressive deepening of the basin from east to west and thinning of Gondwana sediments over the so called Andal high is not observed.

- The Raniganj coalfield is elongated in east-west direction following the trend of the Damodar valley basins. The beds have usually a regional east-west strike with dip towards south.
- Significant local variations in the trend of the beds, however, do occur in conformity with the different sub-basinal structures. The beds have a gentle dip up to 10° . Higher dips are noted near the boundary fault or adjacent to intrabasinal faults.

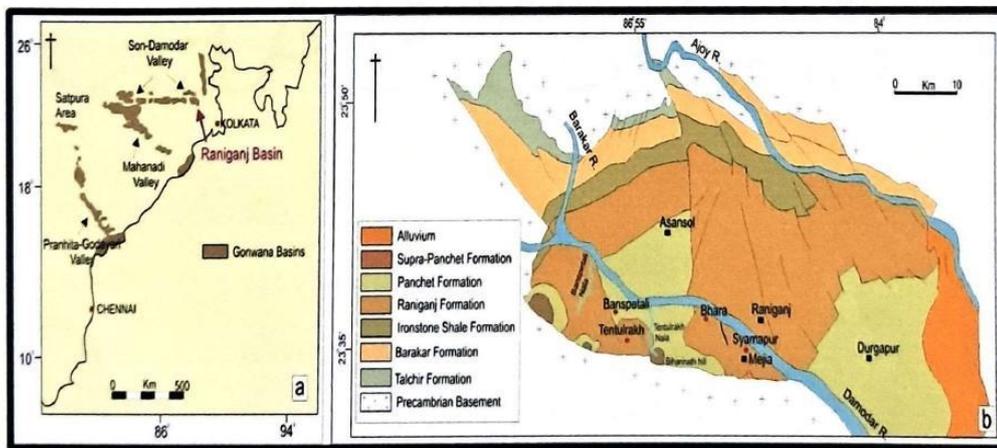


Fig--(a) Geological setting of Raniganj Basin. Distribution of Gondwana Basins in Indian Peninsula showing position of Raniganj Basin (Chakraborty et al., (in press) after Bhattacharya et al., 2018) (b); Generalized geological map of the Raniganj Basin showing the distribution of studied Raniganj Formation and Panchet Formation (Chakraborty et al., (in press) after Tripathi and Satsangi, 1963).



CHAPTER - 3



LOCATION- 1

3.1 Barakar Formation (Barakar River Section near Chirkunda) :

Introduction: The Barakar Formation is a stratigraphic unit of Late Carboniferous to Early Permian age that is found in the Damodar Valley of eastern India. It is named after the Barakar River, which flows through the region. The formation is composed of a sequence of sandstones, shales, and coal seams. The sandstones are typically medium- to coarse-grained and are often cross-bedded. The shales are typically dark gray to black and are often fissile. The coal seams are typically 1 to 2 meters thick and are separated by thin layers of sandstone and shale. At the left bank of the river Barakar near the bridge connecting West Bengal and Jharkhand.

Geological Background: The Barakar Formation is interpreted to have been deposited in a fluvial environment. A good exposure of the Barakar formation at left bank of the river Barakar near Chirkunda village.

The formation is exposed in a number of places in the R. Barakar Put area, including the Barakar River valley and the surrounding hills. The thickness of the formation varies from place to place, but it is typically about 500 meters thick in the R. Barakar Put area.

Rocks exposed along with the bank of the river are silt like body, dark grey coloured shale, planer lamination, trough cross stratification, wedge shaped body and some plant fossil (vertebreria) is present in the formation. Ripple laminated sandstone in the top surface of the bed.

Just crossing the bridge, we see at the fluvial bank of the river very coarse-grained sandstone unit. Some shale present below the sandstone unit. Trough cross stratified sandstone unit.

Primary Sedimentary Structure: -

The primary structures observed in the field are mainly primary sedimentary structure developed in the sedimentary rocks of Barakar Formation. The identified primary structures are bedding, trough cross stratification and compound cross stratification.

- **Trough cross – stratification**

It is characterized by the curved bounding surface of lamina. The channel like bed forms with concave up base and flat top are internally characterized by trough cross stratification. The trough co-sets are composed of multiple sets with varying thickness from base to top.



Fig 3.1.a Trough cross stratification



Fig 3.1.b Trough cross stratification

Ripple Marks: Ripple marks (Fig 3.2.c) are sedimentary structures and indicate agitation by water. Ripple marks are ridges of sediment that form in response to wind blowing along a layer of sediment. They are formed perpendicular to the wind direction and each ridge is roughly equidistant from the ripple mark on either side.



Fig 3.1.c Ripple Marks

Ripple lamination: These sedimentary structures are where the current will initially meet the ripple at the stoss and flow downwards towards the lee side. This results in sand depositing on the lee side creating an asymmetric structure preserved ripple marks of an origin of wave or current processes.



Planar lamination: planar lamination is commonly taken to indicate planar laminae that are more-or-less horizontal (within a few degrees) when originally deposited, and that have more-or-less parallel bounding surfaces (but laminae do vary in thickness laterally).



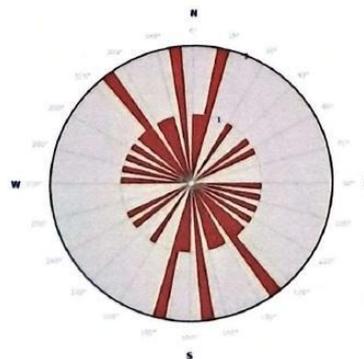
Fig 3.1.d planar lamination

Within shale (Near Chirkunda side): Near chirkunda side there are only deep black shales are present . these are all old shales.



Fig 3.1.e Shale near chirkunda

Rose diagram





Location – 2

BARREN MEASURES (IRON-STONE SHALE)

The Barren Measures Formation in the Raniganj Coalfield overlaps with the Barakar Formation. The two formations are overlapped by a series of rock beds known 'Ironstone Shale or Kulti formation' and 'Raniganj Barakar'. The Barren Measures is a monotonous sequence of dark grey and black shale with numerous beds of ironstone.

The formation has considerable thickness of around 600m in the western part of the basin and shows a decrease in thickness eastwardly. It is completely devoid of carbonaceous horizon.

The Barren Measures is exposed in a number of places in the Damodar Valley, including the Jharia coalfield and the Raniganj coalfield. The thickness of the formation varies from place to place, but it is typically about 100 meters thick. The formation is overlain by the Raniganj Formation.

The rock is exposed in the Barren Measure, we see shallow water environment contains wave ripple (wave length – 7.5 cm, amplitude – 0.7cm).



Fig 3.2.a Barren Measures

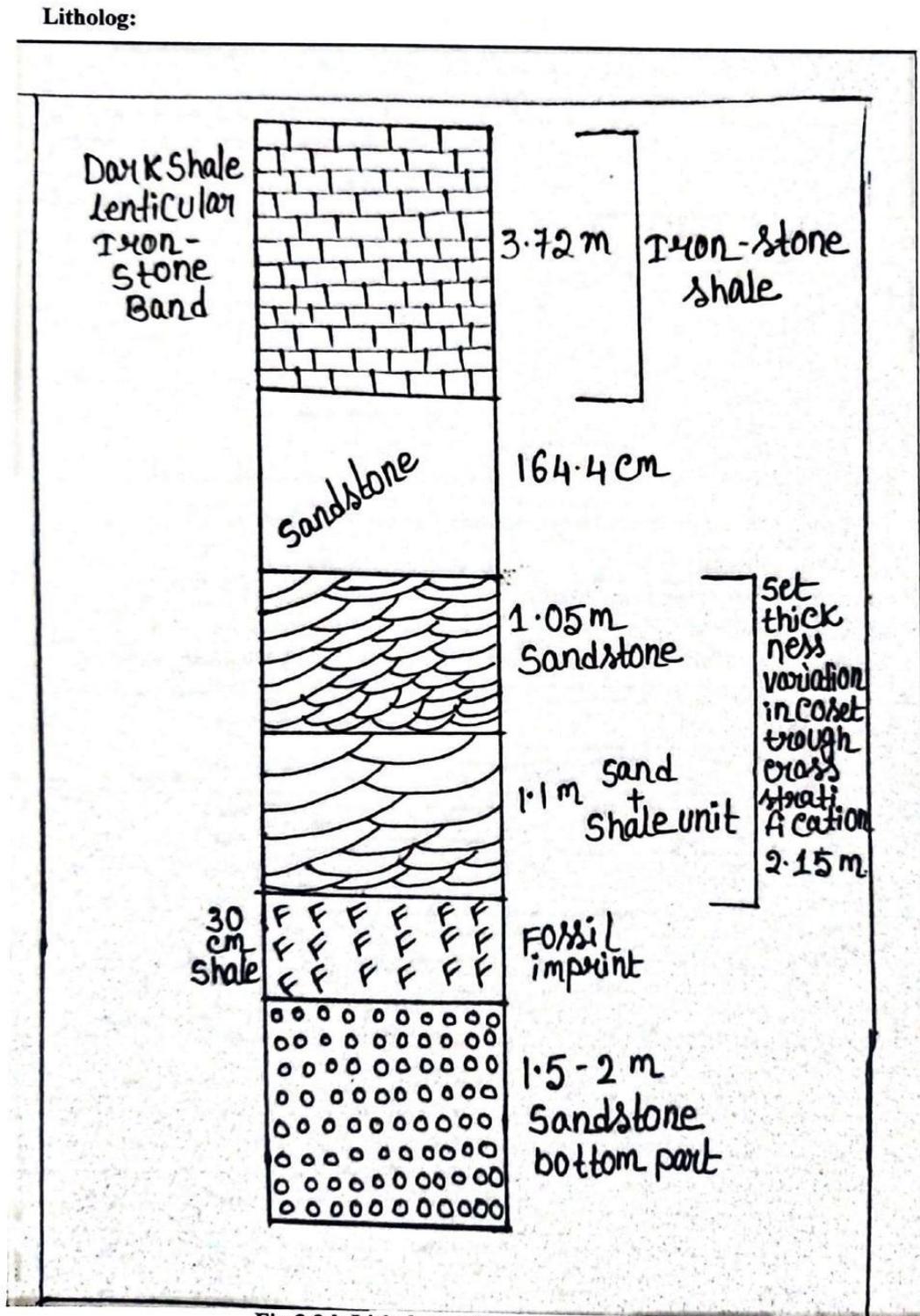


Fig 3.2.b Lithology of barakar and barren measures

Location-3

BHARA & SHYAMAPUR AREA

(A)Convolute laminated sandstone: Yellow or grey coloured coarse to fine grained sandstone. The sandstone bed top most part is convolute laminated & bottom part is Uneven.



Fig 3.3.a A convolute layer at the top of the raniganj formaion

(B)Trough cross-stratified broad channel units: Broad sheet like channel bodies. We observed and studied of Successive Meandering River Channel of Damodar River. The Sandstone of the channel is Trough Cross Stratified Sandstone of Meandering River.



Fig 3.3.b Trough cross stratified sand-stone (bhara)

(C)Massive to locally stratified pebbly sandstone:Characterized mainly by massive pebbly sandstone, but locally passing into crudely cross-stratified sandstone. Pebbles are sparse, frequently oversized and float within a poorly sorted sandy matrix.This facies is a product of rapid deposition from heavily loaded flow, possibly of flash flood origin leading to large scale bank collapse.



(D) Weathered sandstone: Feldspar are decomposed. No feldspar present. Clay contains

(E) Sheet-like planar laminated sandstone: Characterized by sheet-like bodies of sandstone finer grained than facies and containing planar laminae, with local ripples on top. Bases are locally concave-upward. This facies is interpreted as crevasse splay deposit-sheet-flow products deposited as sediment-loaded flood water breached a levee. Those facies units with concave upward bases formed proximal to river channels.

(F) Shale facies (dark coloured shale in carbonaceous matter): The shales are dark, rich in carbonaceous material. Shale facies with lenticular fine sandstone.

(G) Profusion of coal (Sandstone-shale-coal cyclothems): The topmost bed of Raniganj is represented by a 5.5-m- thick single sandstone bed overlying the last coal seam.

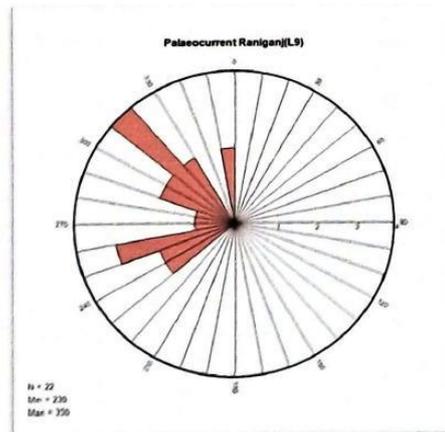
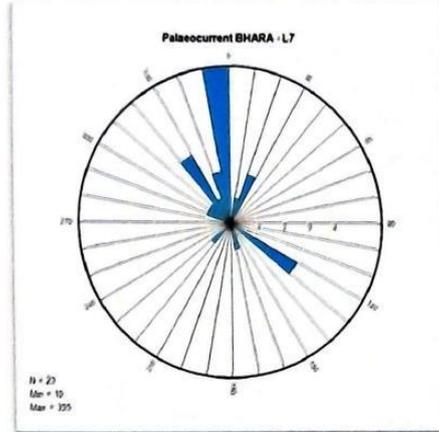


Fig 3.3.c: Vertical dyke of coal within flood-plain shale

(H) Igneous rock: The igneous rocks are less abundant and present as intruded dyke within the rocks of Gondwana. Dolerite is encountered. The rock are mainly coarse grained and consist of plagioclase and pyroxene. Spheroidal weathering is very common in these rocks. Criss-cross alignment of whitish plagioclase laths on the weathered surface, ophitic and sub ophitic texture and also intergranular texture are encountered. Attitude of the Joints Plane Within Dolerite Dyke (At high angle to the Dyke) $45^{\circ}/55^{\circ}$ -SE. Trend of Dolerite Dyke 330° .



Rose diagraph of Bhara & Raniganj as per collected data.





Litholog:

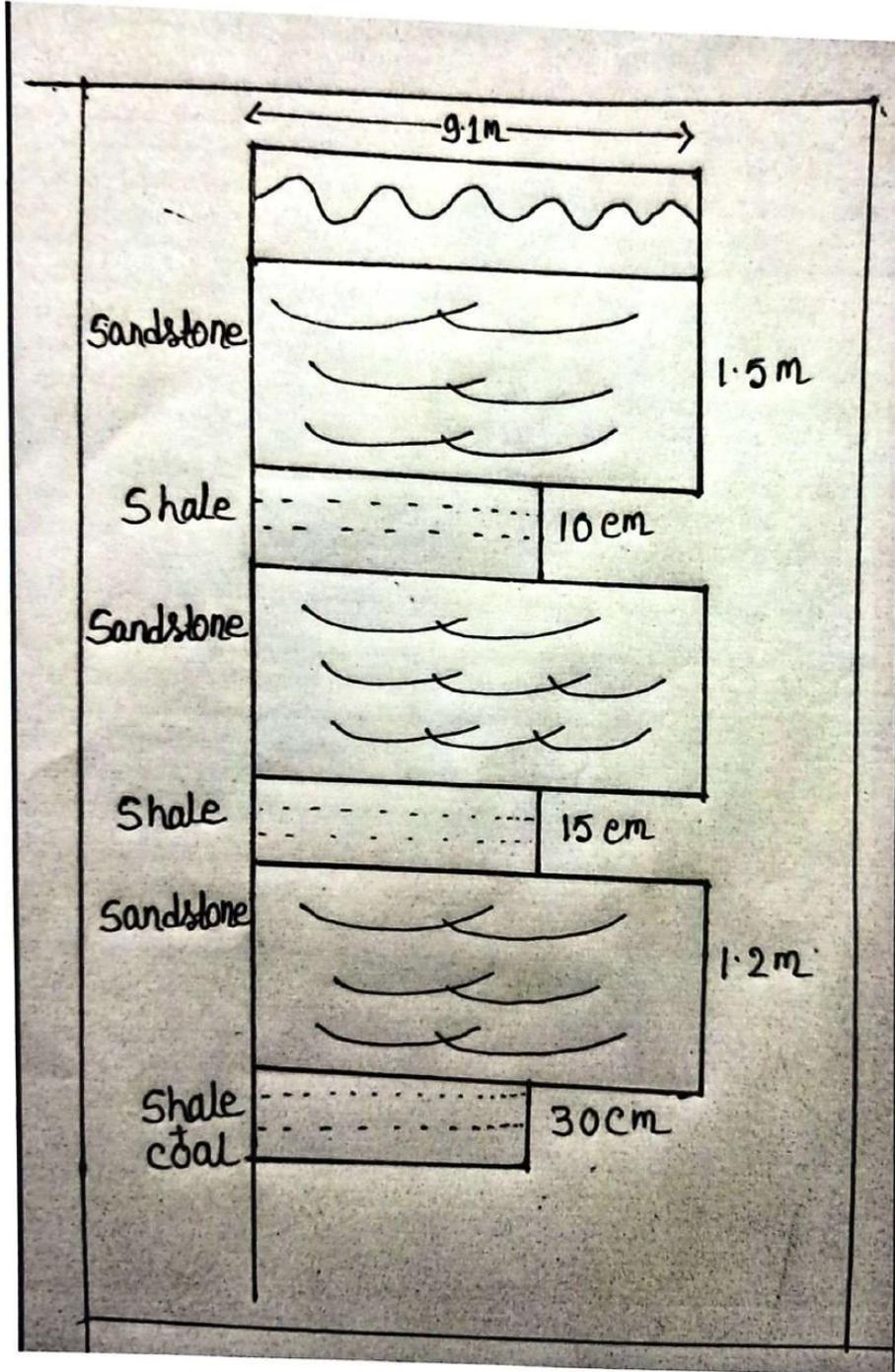


Fig 3.3b lithology of bhara section



Location - 4

Study of Gondwana Rocks in Raniganj Basin ;

Gondwana Supergroup includes continental rift-basin deposits with minor marine inputs formed between late Carbonaceous and middle Jurassic. Deposition took place mainly in three river valley basins: Damodar Valley, Son-Mahanadi Valley, and Pranhit-Godavari Valley. Talchir Formation formed under glaciomarine condition is the oldest. The successively overlying formations include Karharbari, Barakar, Barren Measures, and Raniganj. All these, barring the Barren Measures, contain economically exploitable coal seams. These overlying coal-bearing formations occur on the Panchet Formation and its equivalents in different basins. The youngest Gondwana formation is the Supra-Panchet, which marked the culmination of Gondwana depositional history. The Gondwana formations indicate varied depositional characteristics under varied paleoclimatic conditions like glacial, fluvial, warm, and humid phase.

The plant fossils are common in the Gondwana formations. Gondwana floral varieties were mostly climate-dependent. Scattered occurrences of vertebrate and invertebrates fossils are also found in different formations of Gondwana Supergroup.

Description of Basement Rock Near Panchet Hill At Gobag:

The basement rock near Panchet Hill at Gobag is composed of gneiss and pegmatite. Gneiss is a metamorphic rock that is formed when granite is subjected to high heat and pressure. It is characterized by a banded appearance, with alternating light and dark layers. Pegmatite (fig 3.3.a) is an intrusive igneous rock that is composed of coarse-grained crystals. It is often found in veins or dikes that cut through other rocks.

The gneiss and pegmatite near Panchet Hill are thought to be part of the Archean basement complex of the Indian shield. The Archean is the oldest geological period, and it is thought that the basement rocks of the Indian shield were formed over 3 billion years ago.

The gneiss and pegmatite near Panchet Hill are important because they provide a glimpse into the early history of the Indian subcontinent. They also contain valuable mineral deposits, such as mica, quartz, and feldspar.



Fig 3.4.a Igneous rock



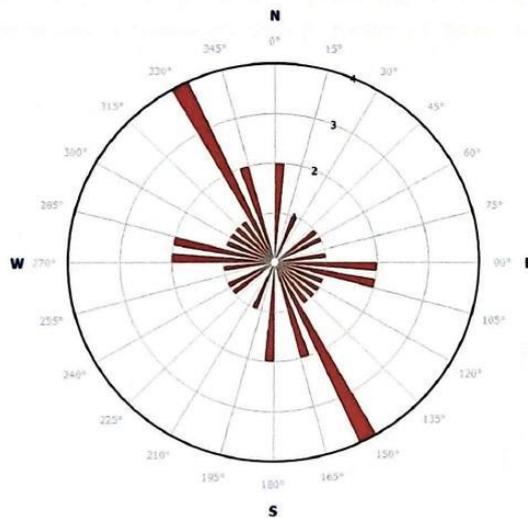
Fig 3.4.b Igneous rock



Gneiss and Pegmatite near Panchet Hill:

- The gneiss is typically light gray or pink in color, with alternating bands of light and dark minerals.
- The pegmatite is typically white or pink in color, with large crystals of quartz, feldspar, and mica.
- The gneiss and pegmatite are both very hard rocks, and they are difficult to break.
- The gneiss and pegmatite are both relatively poor in fossils, as they were formed before life on Earth was abundant.
- The gneiss and pegmatite are both important geological features, and they provide valuable insights into the history of the Indian subcontinent.

Rose Diagram:





Historical Background Of Archiological Site at Garh Panchokot:

Garh Panchkot is an archaeological site located in the Purulia district of West Bengal, India. It is a ruined palace/fort that was destroyed by Maratha Bargi forces in the 18th century. The site is spread over an area of approximately 100 acres and consists of a number of ruins, including the palace, a temple, and a number of other structures.



The earliest evidence of human occupation at Garh Panchkot dates back to the 3rd century BCE. However, the site is most famous for its association with the Malla dynasty, who ruled the area from the 12th to the 18th centuries. The Mallas were a powerful dynasty who controlled a large territory in what is now West Bengal and Jharkhand. They were known for their military prowess and their patronage of the arts and architecture.



Dicussion and Conclusion

Introduction

India was a member of hypothetical supercontinent gondwana and existing towards the southern pole during permo-carboniferous-lower cretaceous times. Typical flora often called Gonadwana flora developed within the continent of gondwanaland during this period. This flora is divided into two parts of lower gondwana and upper gondwana. In the studied area Tentulrakh, Bhara, Syamapur area we also found in many Gondwana plant fossils like Glossopteris, Gangamopteris, Vertebraria, Petrified Wood, Nilssonina etc.

Glossopteris

Glossopteris is an extinct genus of Glossopteridales flora that once dominated the supercontinent Gondwana during the Permian. It is a leaf morphogenus. The leaf of Glossopteris is simple, spatulate, petiolate, lanceolate to tongue-shaped with an entire margin. It is characterised by the presence of a mid-rib made up of several parallel vascular strands that extend to near the leaf tip. The outer bundles of the mid-rib give off laterals that repeatedly dichotomise and anastomose to form a uniform reticulate pattern of veins. Glossopteris is a lower Gondwana flora. Fig-4.1 Glossopteris is located in Syamapur area, near the Mejia, in Bankura district.



Fig:- Glossopteris



Gangamopteris:

Gangamopteris is also an extinct genus of Glossopteridales flora. Like Glossopteris, it is also based on fossil leaves. It is a common element of the Permian Gondwana floras and its general morphology is like that of Glossopteris. Gangamopteris is generally found in the lower Permian rocks. The Gangamopteris leaf is simple and spatulate with a sessile base and an entire margin. Gangamopteris is distinguished by the absence of a well defined mid-rib and more uniform parallel to sub-parallel venation. The whole leaf of Gangamopteris has similar stomatiferous areas bounded by non-stomatiferous areas, another feature used for assignment of a fossil leaf to Gangamopteris. Gangamopteris is a lower Gondwana flora. Fig-Gangamopteris is located in Syamapur area.



Fig:- Gangamopteris



Fig:- Vertebraria

Vertebraria:

The roots of Glossopteris and Gangamopteris plants are called Vertebraria. The genus is well preserved in form of compressions, impressions and petrified fossils. The form has a median ridge or depression with rectangular lateral segments present on its either side that give it the appearance similar to the vertebral column of vertebrates. Vertebraria is upper Gondwana flora. Fig-4.3 Vertebraria is located in Bhara area, in Bankura district.

Petrified wood- *Petrified Wood, fossil formed by the invasion of minerals into cavities between and within cells of natural wood, usually by silica (silicon dioxide, SiO_2) or calcite (calcium carbonate, CaCO_3). It forms when plant material is buried by sediment and*



protected from decay due to oxygen and organisms. Then, groundwater rich in dissolved solids flows through the sediment, replacing the original plant material with *silica*, *calcite*, *pyrite*, or another inorganic material such as *opal*. The result is a fossil of the original woody material that often exhibits preserved details of the bark, wood, and cellular structures. We found in Syamapur area, near the Mejia, in Bankura district.



Petrified Wood

Nilssonia:

Nilssonia is a leaf genus. The leaf is compound with a broad rachis and rectangular leaflets that are attached by the whole base to the rachis. The rachis is ridged and the venation is parallel running from the base to the apex of the leaflet. Leaflets have an entire margin with the lamina attached to the upper surface of the rachis. *Nilssonia* foliage was produced by members of Cycadales. The leaves were arranged in dense clusters on the distal portion of the shoots. *Nilssonia* is a upper Gondwana flora.



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vii. Sample Certificate issued by HOI

Certificate of Participation



Field Work

in the course Field Geology (UG/GEL/405/SEC-2)

A.Y. 2022-23

Kabi Jagadram Roy Government General Degree College

This is to certify that SATHI LAYEK, student of SEM-1 of Geology Honours, of Kabi Jagadram Roy Government General Degree College has successfully completed a field work on "Rocks of Barakar, Barren Measures, Raniganj, Panchet and Suprapanchet formation of Gondwana Super Group within Raniganj Basin" in the course Field Geology (UG/GEL/405/SEC-2).

H.O.D.

Geology Department

Kabi Jagadram Roy Govt. General Degree Colleges,
Mejia , Bankura

Officer-in-Charge

Kabi Jagadram Roy Govt. General Degree Colleges, Mejia , Bankura



Project Work in Environmental Studies (ACSHP/104/AECC-1)

- i. Highlighted part of syllabus**
- ii. List of students certified by HOI**
- iii. Sample project reports**
- iv. Sample Certificate issued by HOI**



i. Highlighted part of syllabus



Bankura University

Environmental Studies (AECC-1)

CBCS w.e.f. 2017-18

BANKURA UNIVERSITY

CBCS SYLLABUS

Ability-Enhancement Compulsory Course (AECC)

COURSE TITLE: Environmental Studies

COURSE CODE: ACSHP/104/ AECC-1

Marks: 50 (40+10)

Credit: 04

**FOR ALL STREAMS OF UNDER GRADUATE HONOURS AND PROGRAM COURSES
(Arts, Science and Commerce)**

Unit 1: Introduction to Environmental Studies

- Multidisciplinary nature of environmental studies
- Definition, Nature, Scope and Importance of environmental studies
- Types and Components of environment
- Sustainable development

Unit 2: Ecosystems

- Concept of Ecology and Eco-system, Structure and Function of an Ecosystem
- Different types of ecosystem; Forest, Desert and Aquatic (Ponds and Oceans) Biomes
- Energy flow in the ecosystem, energy flow models
- Food chains, food webs and ecological pyramids
- Ecological Succession

Unit 3: Natural Resources: Renewable and Non- Renewable Resources

- Land resources: Land degradation, Landslides, Soil erosion
- Forest resources: Uses, types and importance, deforestation and its effects, Forest biodiversity and tribal population
- Water resources: Distribution of water on Earth; Use and over-exploitation of surface and ground water; conflicts over water (international & inter-state)
- Energy resources: Renewable and Non-renewable energy sources; Use of alternative energy sources

Unit 4: Biodiversity and conservation

- Introduction – Definition: Levels of biological diversity: Genetics, Species and Eco-System Diversity, Biodiversity hot spots and mega biodiversity countries.
- Threats to biodiversity; Value (services) of biodiversity; man-wildlife conflicts, biological invasions
- Conservation of biodiversity: *In situ* and *Ex situ* conservation of biodiversity; Endangered and endemic species of India

Unit 5: Environmental Pollution

- Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks.
- Solid waste management: Control measures of urban and industrial waste.
- Fireworks Pollution

Unit 6: Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and its impacts on human communities and agriculture
- Environment Laws: Environment Protection Act, 1986; Air (Prevention & Control of Pollution) Act, 1981; Water (Prevention and control of Pollution) Act, 1972; Wildlife Protection Act, 1972;



Forest Conservation Act, 1920, 1988; International agreements: Montreal protocols, 1987 and Kyoto protocols, 1997 and Convention on Biological Diversity (CBD)

- Tribal populations and rights.

Unit 7: Human Communities and the Environment

- Human population growth: Population Explosion, Impacts on environment, human health and welfare.
- Disaster management: floods, earthquake, cyclones and landslides.
- Environmental movements: Chipko, Silent valley
- Environmental ethics: Role of Indian and other religions and cultures in environmental Conservation
- Environment and human health: Concept of health and diseases (Vector Borne Diseases)
- Human Rights, Value Education, Role of Information Technology in Environment

Unit 8: Field Work (Project Work)

- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification
- Study of simple ecosystems-pond, river etc

Suggested Readings:

1. Carsen, R. 2002. Silent Spring, Houghton Mifflin, Harcourt.
2. Rao, M.N. & Datta A.K. 1987. Waste Water Treatment, Oxford and IBH Publishing Co. Pvt. Ltd.
3. Raven, P.H. Hassenzahl, D.M. & Berg L.R., 2012 Environment. 8th Edition. John Wiley & Sons.
4. Singh, J.S. Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
5. Agarwal, K.C. 2001 Environmental Biology, Nidi Publication Ltd. Bikaner.
6. Bharucha Erach, The Biodiversity Biology of India, Mapin Publishing Pvt. Ltd. Ahmedabad, India
7. Cunningham, W.P. Cooper, T.H. Gorhani, E. & Hepworth, M.T. 2001, Environmental Encyclopedia. Jaico Publ. House. Mumbai. 1196p.
8. Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge University Press.
9. Jadhav, H. & Bhosale V.M. 1995. Environmental Protection and Laws, Himalaya Publishing House, Delhi
10. McKinney, M.L. & Schoch, R.M. 1996. Environmental Science systems & Solutions, Web enhanced edition.
11. Saha T.K. 2010. Ecology and Environmental Biology, Books and Allied (P) Ltd. Kolkata.
12. Santra S.C. 2005. Environmental Science, New Central Book Agency (P) Ltd. Kolkata.
13. Singh, S. 1991. Environmental Geography, Prayag Pustak Bhawan, Allahabad.
14. Roy, S. 2003. Environmental Science, Publishing Syndicate, Kolkata
15. Sharma, P. D. 2012. Ecology and Environment, Rastogi Publication
16. Dash, M. C. 2001. Fundamentals of Ecology, Tata McGraw-Hill Publishing Company Ltd
17. Arora, Mohan P. 2009. Ecology, Himalaya Publishing House
18. Saha T.K. 2010. Ecology and Environmental Biology, Books and Allied (P) Ltd. Kolkata.
19. Santra S.C. 2005. Environmental Science, New Central Book Agency (P) Ltd. Kolkata.
20. Environmental Studies—Prof S.V.S Rana.—Rastogi Publication.
21. Text book of Ecology: The Experimental Analysis of distribution & abundance—(Charles J. Krebs). Pearson Education.
22. Erach Bharucha, 2016. Text Book of Environmental Studies for Undergraduate Courses (Second Edition) for UGC. University Press.

Marks Division: 40 (Theory) + 10 (Project Work/Field Work/Internal) = 50 Marks



ii. Certified List of students and projects



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Date: 24.01.2023

To whom it may concern

[Sub: Completion of Environmental Studies project work by the 1st semester students from all discipline]

The undersigned hereby certifies that the students mentioned in the table given below have successfully completed their projects in the course **Environmental Studies (Course Code: ACSHP/104/AECC-1), semester-I, AY- 2022-23**. The titles of their projects, UIDs of Bankura University, college roll numbers and programme under which they have been enrolled are given in the table.

Sl no	Name	UID	Roll No.	Programme	Title of project work
1	MAMONI MAL	22221101001	2212083	Bengali (Hons)	Environment Pollution
2	BAISAKHI MONDAL	22221101002	2212007	Bengali (Hons)	Medicinal plants of Bankura district
3	SANJAY BHADRA	22221101003	2212006	Bengali (Hons)	Environment Pollution
4	CHAITALI DAS	22221101004	2212078	Bengali (Hons)	Butterfly species of Mejia
5	CHUMKI MAJI	22221101005	2212053	Bengali (Hons)	Study of a common insect: Cockroach
6	PIU MONDAL	22221101006	2212119	Bengali (Hons)	Study of common birds in West Bengal
7	SHREYA BHATTACHARYA	22221101007	2212124	Bengali (Hons)	Environment Pollution
8	JHUMPA MONDAL	22221101008	2212118	Bengali (Hons)	Study of common birds in West Bengal
9	RATNA MANDAL	22221101009	2212094	Bengali (Hons)	Study of a common insect: Mosquito
10	LATIKA GORAI	22221101010	2212021	Bengali (Hons)	Study of common birds in West Bengal
11	DILRUBA KHATUN	22221101011	2212002	Bengali (Hons)	Study of common birds in West Bengal
12	SUMAN DAS	22221101012	2212128	Bengali (Hons)	Environment Pollution
13	SOAYBIA KHATUN	22221101013	2212001	Bengali (Hons)	Study of common birds in West Bengal
14	PRITI KANA DUBEY	22221101014	2212129	Bengali (Hons)	Butterfly species of Mejia
15	NANDITA BAURI	22221101015	2212140	Bengali (Hons)	Environment Pollution
16	KRISHNA GORAI	22221101016	2212148	Bengali (Hons)	Study of common birds in West Bengal
17	JHUMA MAJI	22221101017	2212151	Bengali (Hons)	Environment Pollution
18	NAFIJA KHATUN	22221101018	2212147	Bengali (Hons)	Study of common birds in West Bengal
19	SAMPA PATAR	22221201001	2210064	Bengali (Prog)	Study of common birds in West Bengal
20	MOUMITA MAJI	22221201002	2210045	Bengali (Prog)	Butterfly species of Mejia
21	SIMA BAURI	22221201003	2210122	Bengali (Prog)	Study of a local tree: Banyan tree
22	ANISHA DUTTA	22221201004	2210042	Bengali (Prog)	Environment Pollution




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23	CHANDAN BAURI	2221201005	2210101	Bengali (Prog)	Study of a local tree: Banyan tree
24	JHILIK BAURI	2221201008	2210121	Bengali (Prog)	Butterfly species of Mejia
25	MONIMOHAN CHATTERJEE	2221201009	2210120	Bengali (Prog)	Environment Pollution
26	ANANTA MAJI	2221201010	2210011	Bengali (Prog)	Butterfly species of Mejia
27	PAYEL KUNDU	2221201011	2210033	Bengali (Prog)	Environment Pollution
28	SUMITRA MODAK	2221201012	2210061	Bengali (Prog)	Environment Pollution
29	CHAITALI MAJI	2221201013	2210077	Bengali (Prog)	Study of common birds in West Bengal
30	CHINTAHARAN MAJI	2221201014	2210062	Bengali (Prog)	Study of a local tree: Banyan tree
31	LIPIKA MONDAL	2221201015	2210036	Bengali (Prog)	Study of common birds in West Bengal
32	RITU PAL	2221201016	2210112	Bengali (Prog)	Study of common birds in West Bengal
33	CHANDRA SHIT	2221201017	2210113	Bengali (Prog)	Study of a local tree: Banyan tree
34	SUMAN KARMAKAR	2221201018	2210084	Bengali (Prog)	Environment Pollution
35	SANGITA MONDAL	2221201021	2210072	Bengali (Prog)	Environment Pollution
36	SOUVIK GHOSHAL	2221201022	2210003	Bengali (Prog)	Environment Pollution
37	PRAKASH MONDAL	2221201023	2210063	Bengali (Prog)	Study of a common insect: Cockroach
38	LAXMI GHOSAL	2221201026	2210048	Bengali (Prog)	Medicinal plants of Bankura district
39	SUMANTA MAJI	2221201028	2210089	Bengali (Prog)	Study of a common insect: Cockroach
40	SUBHAM MANDAL	2221201029	2210046	Bengali (Prog)	Environment Pollution
41	ASHOK DAS	2221201030	2210009	Bengali (Prog)	Environment Pollution
42	AKSHAY KUMAR MAJI	2221201031	2210024	Bengali (Prog)	Study of a common insect: Cockroach
43	RAJIB MAJI	2221201033	2210123	Bengali (Prog)	Study of a common insect: Cockroach
44	SHOUVIK DUTTA	2221201034	2210004	Bengali (Prog)	Study of common birds in West Bengal
45	RAJESH MONDAL	2221201035	2210115	Bengali (Prog)	Study of common birds in West Bengal
46	SHRABONI MONDAL	2221201039	2210075	Bengali (Prog)	Study of common birds in West Bengal
47	SWEETI KUNDU	2221201040	2210126	Bengali (Prog)	Environment Pollution
48	REKHA BAURI	2221201042	2210130	Bengali (Prog)	Study of common birds in West Bengal
49	RAHUL RUIDAS	2221201043	2210141	Bengali (Prog)	Study of a common insect: Cockroach
50	DIPA GHOSH	2221201044	2210142	Bengali (Prog)	Medicinal plants of Bankura district
51	RUPAK DAS	2221201045	2210133	Bengali (Prog)	Environment Pollution
52	BRISTI GORAI	2221201047	2210158	Bengali (Prog)	Environment Pollution
53	RIYA KARMAKAR	2221201048	2210135	Bengali (Prog)	Study of common birds in West Bengal
54	RAKHI BAURI	2221201049	2210136	Bengali (Prog)	Study of common birds in West Bengal
55	CHAND DHIBAR	2221201050	2210137	Bengali (Prog)	Study of a common insect: Cockroach
56	DIPIKA DAS	2221201051	2210139	Bengali (Prog)	Environment Pollution




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Web: www.ggdcmejia.in

57	RAHUL GHOSH	22221201052	2210153	Bengali (Prog)	Environment Pollution
58	PARIMAL MONDAL	22221201053	2210154	Bengali (Prog)	Study of a common insect: Mosquito
59	MOUMITA GHOSH	22221103001	2214095	English (Hons)	Study of water pollution in Damodar
60	APARNA GORAI	22221103002	2214054	English (Hons)	Study of a common insect: Mosquito
61	ISHITA KARMAKAR	22221103003	2214117	English (Hons)	Medicinal plants of Bankura district
62	ARPITA PASWAN	22221103005	2214028	English (Hons)	Study of common birds in West Bengal
63	SOMA MONDAL	22221103006	2214041	English (Hons)	Environment Pollution
64	NILIMA MAJI	22221103007	2214038	English (Hons)	Study of a local tree: Banyan tree
65	SIMA MAJI	22221103008	2214111	English (Hons)	Study of a local tree: Banyan tree
66	BRISTI MONDAL	22221103009	2214015	English (Hons)	Medicinal plants of Bankura district
67	SUMITRAMURMU	22221103010	2214122	English (Hons)	Medicinal plants of Bankura district
68	DIYA MONDAL	22221103013	2214138	English (Hons)	Study of a local tree: Banyan tree
69	SABNAAM KHATUN	22221104001	2216035	History (Hons)	Environment Pollution
70	DIPA MONDAL	22221104002	2216082	History (Hons)	Environment Pollution
71	FARIJA KHATUN	22221104003	2216025	History (Hons)	Environment Pollution
72	PRIYA MONDAL	22221104004	2216081	History (Hons)	Study of common birds of West Bengal
73	MAMONI DHANG	22221104006	2216085	History (Hons)	Study of a local tree: Banyan tree
74	SHILPA GORAI	22221104007	2216014	History (Hons)	Study of a local tree: Banyan tree
75	SUMAN DAS	22221104008	2212128	History (Hons)	Study of common birds in West Bengal
76	PRIYANKA CHATTERJEE	22221104009	2216039	History (Hons)	Study of common birds in West Bengal
77	PRIYANKA PAL	22221104010	2216110	History (Hons)	Study of water pollution in Damodar
78	MAMONI GOPE	22221104011	2216100	History (Hons)	Environment Pollution
79	SOMA MONDAL	22221104012	2216043	History (Hons)	Environment Pollution
80	BAISHAKHI BEJ	22221104013	2216099	History (Hons)	Medicinal plants of Bankura district
81	MOU DAS	22221104014	2216044	History (Hons)	Medicinal plants of Bankura district
82	INDRANIL DHARA	22221104015	2216065	History (Hons)	Butterfly species of Mejia
83	SHILPA THANDAR	22221104016	2216067	History (Hons)	Butterfly species of Mejia
84	PRAJAPATI PAL	22221104017	2216109	History (Hons)	Butterfly species of Mejia
85	ARPITA DHIBAR	22221104018	2216131	History (Hons)	Study of a common insect: Mosquito
86	SIYA BEJ	22221104019	2216155	History (Hons)	Study of water pollution in Damodar
87	LAKSHMI GORAI	22221104020	2216157	History (Hons)	Study of water pollution in Damodar
88	PRATIMA HANSDA	22221204001	2210070	History (Prog)	Study of a common insect: Mosquito
89	SANDIP MAJI	22221204002	2210114	History (Prog)	Study of a common insect: Mosquito
90	BARSHA KUMBHAKAR	22221106002	2217066	Philosophy (Hons)	Medicinal plants of Bankura district



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91	ANURADHA MAJI	22221106005	2217051	Philosophy (Hons)	Butterfly species of Mejia
92	BEAUTY LAYEK	22221106006	2217052	Philosophy (Hons)	Environment Pollution
93	RUMKI MAJI	22221106007	2217056	Philosophy (Hons)	Study of water pollution in Damodar
94	BARADA GORAI	22221106008	2217055	Philosophy (Hons)	Study of water pollution in Damodar
95	BRISTI KARMAKAR	22221106009	2217091	Philosophy (Hons)	Study of water pollution in Damodar
96	KABERI MAJI	22221106010	2217127	Philosophy (Hons)	Study of a common insect: Mosquito
97	CHANDANA ADHIKARI	22221106011	2217086	Philosophy (Hons)	Study of common birds in West Bengal
98	MALOY MONDAL	22221106012	2217076	Philosophy (Hons)	Study of common birds in West Bengal
99	URMILA MURMU	22221106013	2217074	Philosophy (Hons)	Study of common birds in West Bengal
100	MAMATA GORAI	22221106014	2217150	Philosophy (Hons)	Study of common birds in West Bengal
101	SHILPI ADHIKARI	22221106015	2217145	Philosophy (Hons)	Environment Pollution
102	MADHU DEY	22221206001	2210068	Philosophy (Prog)	Study of common birds in West Bengal
103	BHOLANATH MAJI	22221206002	2210069	Philosophy (Prog)	Study of common birds in West Bengal
104	ADITI GOPE	22223120003	2235013	Geology (Hons)	Study of common birds in West Bengal
105	SUBHAJIT KUNDU	22223120007	2235034	Geology (Hons)	Study of common birds in West Bengal




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iii. Sample project reports

KABI JAGADRAM ROY GOVT. GENERAL DEGREE COLLEGE

PROJECT TITLE: STUDY OF COMMON BIRDS OF WEST BENGAL
SUBJECT: ENVIRONMENTAL STUDIES (ACSHP/ 104/ AECC-1)
NAME: ADITI GOPE
PROGRAMME NAME: GEOLOGY (HONS)
CLASS: 1ST SEM
ROLL NO.: 2235013

Debraj Das 5/11/22
EXAMINED
Kabi Jagadram Roy Govt. General
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Mejia, Bankura



ACKNOWLEDGEMENT

I Am Thankful To All Respected Professors For Advice And Computation with Their Guidance And Supervision. I Have Been Able To Complete This project. The Project Thought Me A Lot About Study of Common Birds of west Bengal And way To. Preserve It. I Am Thankful To My Professor Dr. Debnaj Das For giving Me This Topic I have Been able To Learn A Lot About It.



CONTENTS

SJ-NO	CONTENTS	Page NO. - 1
1.	INTRODUCTION	
2.	COMMON BIRDS OF WEST BENGAL	
3.	ECOLOGICAL IMPORTANCE OF BIRDS	
4.	MODERN THREATS TO BIRDS	
5.	CONSERVATION PROJECTS FOR BIRDS	
6.	CONCLUSION	
7.	REFERENCE	



INTRODUCTION

Birds are feathered, winged, two-legged, warm blooded, egg-laying vertebrates. Modern birds are characterised by feathers, a beak with no teeth, the laying of hard shelled eggs, a high metabolic rate, a four-chambered heart, and a light weight but strong skeleton. Birds also have digestive and respiratory systems that are uniquely adapted for flight. Some birds, especially crows and parrots are among the most intelligent animal species. They transmit knowledge across generations. Many species annually migrate great distances and many more perform shorter irregular movements. Birds are social communicators with visual signals, call and songs.

Birds walk, run, hop, swim, perch, cling, fly and even dig. They live in woodlands, open areas, cities, farmlands, swamps even the open ocean. They lay their eggs and raise their young in holes in the ground in nests of varying complexity in vegetation or on the ground, in holes in trees in human-constructed nest boxes and in or on various parts of buildings.



SOME COMMON BIRDS OF WEST BENGAL

1. COCKATOO :-

As a breed, they are known for being smart, curious and very loving. So loving, in fact cockatoos are often called "love sponges"! Along with the psittacocidea (true parrots) and the Strigopidea (New Zealand parrots). They make up the order psittaciformes (parrots). The name cock too comes from the Malay name for these birds, kaka (K) tua, via the Dutch kakatoe. Cockatoos are recognizable by showy crests and curved and strong bills.

→ Scientific Name : Cockatoos

→ Distribution : These parrots have a relatively small distribution. All 21 species live in either Australia, the Philippines, or Indonesia. Some species live across expanses of land like Australia, while others inhabit only a handful of islands.

→ Habitat : Cockatoos are usually relatively in their habitat preferences. Some species live in several different types of ecosystems, but most prefer in single type of habitat. As a whole, they live in a variety of habitat types. They inhabit montane (or neotropical) forests, mangroves, shrublands, rainforests, dry forests, and more. Some species also live in farmland, crop fields, and even parks or cities.



→ Bengali Common Name :- "kakotua".



2. WEAVER :-

They are particularly well-known for their woven nests. which in some African species of weavers are highly gregarious.

→ Scientific Name :- weavers.

→ Distribution :- The vast majority of weaver species live in Africa, though a few species also live in Asia. In Africa they range from the southern edge of the Sahara Desert to the southern tip of the continent throughout the continent.

Each species has its while others live only in a small region.

→ Habitat :- Different weaver species inhabit different types of habitats. Some prefer living in open grasslands at Africa. Others prefer living in dense forests high in the mountains.

→ Bengali Common Name :- "Babui"





3. INDIAN DOMESTIC PIGEON ÷

The Domestic Pigeon is a pigeon like pigeon that derived from the rock pigeon. The Rock pigeon is the world's oldest domesticated bird.

- Scientific Name ÷ *Columba livia domestica*
- Distribution ÷ The Rock Dove has a restricted natural resident range in western and southern Europe, North Africa and into South Asia.
- Habitat ÷ Pigeon habitat is natural cliffs, usually on coasts. Its domesticated form from the feral pigeon has been widely introduced in cities much of the world.
- Bengali common name ÷ "Payena"



4. HOUSE CROW

The house crow, also known as the Indian, grey-necked, ceylon or ceylon crow, is a common bird of the crow family that is of Asian origin but now found in many parts of the world.



- Scientific Name :- *Corvus splendens*.
- Distribution :- It has a widespread distribution in Southern Asia, being native to Nepal, Bangladesh, India, Pakistan, Sri Lanka, Thailand and Coastal Southern China.
- Habitat :- Indian House crow are strongly commensal living in close association with people and relying on food scraps and others waste. They prefer highly disturbed types. House crows or food scraps a more important factor on abundance and distribution.
- Bengali Common Name :- "Kak"



15. HOUSE SPARROW :-

The house sparrow is a bird of the sparrow family passeridae found in most of the world. As a small bird it has a typical length of 16 cm (6.3 in) and a mass of 24-39.5g (0.85-1.40 oz). They have bright black, white and brown markings.



- Scientific Name :- *Passer Domesticus*
- Distribution :- All over the world mainly originated in middle east.
- Habitat :- The House Sparrow is closely with Human and cultivation.
- Bengali common Name :- "Chonei".



6. COMMON MYNA :-

The common myna or India myna *Sturnia Sordidus* spelled maynah. is a member of the family Sturnidae native to Asia. An omnivorous open woodland bird with a strong territorial instinct, the myna has adapted extremely well to urban environments.

The common myna is brown with a black head. It has a yellow bill, legs and bare skin in flight it shows white wing patches.

- Scientific Name :- *Acridotheres Tristis*.
- Habitat :- This abundant passerine is typically found in open woodland, cultivation and around habitation.



→ Bengali Common Name :- "Salikh".





ECOLOGICAL IMPORTANCE OF BIRDS

- Birds occupy many levels of trophic webs, from mid-level consumers to top predators.
- As with other native organisms, birds help maintain sustainable population levels of their prey and predators species and often food for and decomposers.
- Many birds are important in plant reproduction through their presence in as pollinators or seed dispersers.
- Some birds are considered keystone species as their presence in an ecosystem affects other species indirectly.

MODERN THREATS TO BIRDS

Having survived an ice-age, numerous volcanic eruptions, eruptions and earthquakes, our native species have endured some life-changing circumstances, but nothing has been more disruptive than arrival of humans. The most devastating threat to the survival of our native species has been the introduction of mammalian pests such as stoats, possums, ants and deer.

Other human induced threats to our native wildlife have included:-

- Felling of Native Forests for timber.
- Damming of lakes and Rivers for hydro-electric development.
- Over-fishing and By-catch of marine mammals in over oceans.
- Run-off of fertilizers and effluent from agriculture in our waterways.



CONSERVATION OF BIRDS OF INDIA

Scientists and conservation professionals have developed a number of techniques to protect birds species these techniques have had varying.

capture Breeding
Reintroduction and Translocations
Habitat protection

AND PROJECT LIKE

Project Great Indian Bustard
Protection of Migratory
Save our Sparrows.

CONCLUSION

Birds finding in your backyard Birds watching also know as birding is one of the fastest growing forms of outdoor recreation in the country. Birds watching is the observation of wild birds rather than caged or domesticated birds, Birding is simply a matter of leaving what to look or listen for Bird watching is a good way for learn the species of birds that live in your specific area and see how they behave. Birds watching is a super reason to visit unique places and trail to exotic birds species - you will find people birding in just about my city town or country.



REFERENCE

Importants of Birds

Birds occupy many levels of trophic webs, from mid-level consumers to top predators. As with other native organisms, birds help maintain sustainable population levels of their prey and predator species and often death, provide food for scavengers and decomposers.

Many birds are important in plant reproduction through their services as pollinators or seed dispersers. Birds also provide critical resources for their many host-specific that withlike on birds from plant and even between countries.

Some birds are considered key to species as their presence in (or disappearance from) an ecosystem affects other species indirectly. For example, woodpeckers create cavities that are then used by many other species. After the extinction of the dodo, it was discovered that a tree whose fruits had been primary food item of the dodo through the dodo's digestive tract, which process scarified the seed coat and enabled germination.

Modern Threats in Birds

Birds are often considered to be outstanding indicators of the health of the overall environment. Rather like the proverbial canary in the coalmine, they are readily affected by physical and chemical impacts on their ecosystems whether these are caused by natural or man-made influences. When communities of birds change many species of birds have become specialised to occupy certain niches and together they inhabit almost every conceivable habitat, they are



diversity and trends in other animals and plants with which they coexist.

Unlike some other group of animals that are also good environmental indicators such as frogs, birds are easy to observe and identify and most are active during the day.

There are many different conservation issues which have an impact on Asian birds. The nature of these issues is often but not others which may be restricted to a specific site may only affect individual species.

BIRD CONSERVATION

Bird conservation is a field in the science of conservation biology related to threatened birds. Humans have a profound effect on many bird species. Over an hundred species have gone extinct in historical times. Although the most dramatic human-caused extinctions occurred in the Pacific Ocean as humans colonised the islands of Melanesia, Polynesia and the World War, during which an estimated 750-1800 species of birds became extinct. According to World War Institute, many bird populations are currently declining worldwide, with 1,200 species facing extinction in the next century. The biggest cited reason surrounds habitat loss. Other threats include overhunting, accidental mortality due to structural collisions, by pet birds, and including legislation, preserving and restoring bird habitat and establishing captive populations for reintroductions.



See Late Quaternary brachyonic birds for which
trapped in prehistoric and early historic times. Usually
due to human activity (ie starting with the upper
palaeolithic Revolution) For birds having gone extinct in
modern times (since 1500) see list of extinct birds.

Aditi Gope
05.11.2022

Debraj Das 5/11/22
EXAMINED
Kabi Jagadram Roy Govt. General
Degree College
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**KABI JAGADRAM ROY GOVT.
GENERAL DEGREE COLLEGE**

PROJECT TITLE: STUDY OF A COMMON INSECT: MOSQUITO
SUBJECT: ENVIRONMENTAL STUDIES (ACSHP/ 104/ AECC-1)
NAME: ARPITA DHIBAR
PROGRAMME NAME: History (Honours)
CLASS: 1ST SEM
ROLL NO.: 2216131

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একটি সাধারণ পতঙ্গের অধ্যয়ন: মশা

মশা, (ফ্যামিলি কিউলিসিডে), পরিচিত পোকামাকড়ের প্রায় 3,500 প্রজাতির যে কোনো একটি, যার মধ্যে কিছু নারীদের রক্তচোষা অভ্যাসের কারণে জনস্বাস্থ্যের জন্য গুরুত্বপূর্ণ। মশা এক প্রকারের ছোট মাছি প্রজাতির পতঙ্গ। অধিকাংশ প্রজাতির স্ত্রীমশা স্থান্যপায়ী প্রাণীর রক্ত পান করে থাকে। মেরুদণ্ডী প্রাণীর, যেমন স্থান্যপায়ী প্রাণী, পাখি, সরীসৃপ, উভচর প্রাণী এবং এমনকি কিছু মাছের শরীর থেকে রক্ত শোষণ করে হাজার রকমের প্রজাতি রয়েছে। যদিও যেসব প্রাণীর শরীর থেকে রক্ত শুষে নেয় তা তাদের শরীরের তুলনায় খুবই অল্প, কিন্তু কিছু মশা রোগজীবাণু সংক্রামক। মশার

মাধ্যমে ম্যালেরিয়া, ডেঙ্গু, ফাইলেরিয়া, পীতব্বর, জিকা ভাইরাস প্রভৃতি রোগ সংক্রমিত হয়।

মশার দাঁত সংখ্যা ৪৭টি। মশা কিন্তু রক্ত খেয়ে বেঁচে থাকে না! মূলত রক্তের প্রোটিন অংশটি কাজে লাগিয়ে তারা ডিম পাড়ে। তাইতো পুরুষ মশা কখনো হন ফোটার না।

পুরুষ মশা কেবল একদিন বাঁচে। নারী মশা সচরাচর ৬-৮ সপ্তাহ বেঁচে থাকে। আর পুরুষ মশা একদিনের বেশি বাঁচলেও; তাদের পরিস্থিতি একেবারেই নাজুক হয়ে পড়ে। এই ছোট মাছি প্রজাতির পতঙ্গ দীর্ঘ ২৫০০ বছর ধরে পৃথিবীর বুকে টিকে আছে!

প্রজাতি

মশা নেমাটোসেরা মাছি বর্গের অন্তর্ভুক্ত। আরও স্পষ্ট করে, মশা মূলত ক্রেন মাছি পরিবারের অন্তর্ভুক্ত। মশার কিছু প্রজাতির নারী মশা রক্ত শোষে এবং মারাত্মক সংক্রামক রোগ বিস্তার করে। কিছু প্রজাতির মশা রক্ত শোষণ করে না; আবার যেসব প্রজাতির মশা রক্ত শোষে তাদের মধ্যে অনেকের রক্তে "উচ্চ থেকে নিম্ন চাপ" সৃষ্টি করে তা শোষণ করে এবং কোনওরকম রোগ বিস্তার করে না। রক্ত শোষণকারী প্রজাতির মধ্যে শুধু নারীরাই রক্ত শোষণ করে।

পৃথিবীর বিভিন্ন স্থানে ৩,৫০০ এর বেশি প্রজাতির মশা পাওয়া গেছে। যেসব মশা নিয়মিত মানুষকে কামড়ায় তারা প্রতি বছর লক্ষ লক্ষ মানুষের শরীরে রোগজীবাণু সংক্রমণের চলক হিসেবে কাজ করে। অন্য যেসব প্রজাতি নিয়মিত মানুষকে কামড়ায় না, কিন্তু অন্যান্য প্রাণীদের শরীরে রোগ সংক্রমণের চলক, তারা মূলত বিভিন্ন কারণে, যেমন হঠাৎ বন ধ্বংস, তাদের বাসস্থান থেকে উৎখাত হলে



স্বভিকর হয়ে ওঠে। অ্যালোফিলিস, কিউলেব্র, এডিস, হেমাগোগাস, প্রকৃতি হল রোগ সংক্রমণের চলক হিসেবে কাজ করা মশাদের বিভিন্ন প্রজাতির মধ্যে উল্লেখযোগ্য ও সাধারণভাবে সবচেয়ে পরিচিত।

জীবনচক্র

প্রাপ্তবয়স্কদের পাতলা দীর্ঘায়িত শরীর আঁশ দিয়ে আবৃত থাকে, যেমন ডানার শিরা। মশাগুলি লম্বা ভাস্কর চেহারার পা এবং লম্বা ছিদ্র করা মুখের অংশ দ্বারা চিহ্নিত করা হয়। পুরুষের পালকের অ্যান্টেনা সাধারণত মহিলাদের তুলনায় ঝোপঝাড় হয়। পুরুষ এবং কখনও কখনও মহিলারা অমৃত এবং অন্যান্য উদ্ভিদের রস খায় এবং পরিচিত পরাগায়নকারী। তবে বেশিরভাগ প্রজাতিতে, স্ত্রীদের ডিম পরিপক্ব করার জন্য রক্তের খাবার থেকে প্রাপ্ত প্রোটিনের প্রয়োজন হয়। বিভিন্ন প্রজাতির মশা পছন্দ দেখায় এবং, অনেক ক্ষেত্রে, প্রাণীদের হোস্ট করার জন্য সংকীর্ণ বিধিনিষেধ।

সকল মাদির মত, মশার জীবনচক্র চারটি পর্যায়ে বিভক্ত: ডিম, শূক, মুককীট, এবং পূর্ণস মশা। বেশির ভাগ প্রজাতির পূর্ণস নারী মশা বন্ধ পানি বা জলাশয়ে ডিম পাড়ে; কিছু পানির কাছাকাছি ডিম পাড়ে, বাকিরা জলজ উদ্ভিদে ডিম পাড়ে। প্রত্যেক প্রজাতি ডিম পাড়ার জন্য পানিতে বা পানির কাছাকাছি অবস্থান নির্বাচন করে এবং পারিশার্ধিকতার সাথে খাপ খাইয়ে নেয়। কিছু হ্রদে ডিম ছাড়ে, কিছু সাময়িক ডোবায় ডিম ছাড়ে, কিছু জলাভূমিতে ডিম ছাড়ে, আবার কিছু লবণাক্ত জলাভূমিতে ডিম ছাড়ে। লবণাক্ত পানিতে ডিম পাড়া মশাদের মধ্যে সমান সংখ্যক প্রজাতি বাড়িতে পরিষ্কার পানিতে ও লবণাক্ত পানিতে ডিম পাড়ে, যার এক-তৃতীয়াংশ সমুদ্রের পানিতে এবং বাকিরা লবণাক্ততার সাথে খাপ খাইয়ে নেয়।

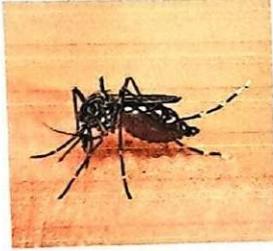


Figure 1 Aedes



Figure 2: Anopheles



Figure 3: Culex



ডিম

প্রজাতি অনুযায়ী মশার ডিম পাড়ার ধরনের পার্থক্য রয়েছে। সবচেয়ে সহজ পদ্ধতি হল নারী মশা পানির উপরে উপর নিচে উড়াউড়ি করে এবং পানিতে ডিম ছাড়ে। এটা মূলত অ্যানোফিলিস প্রজাতি বেশি করে থাকে। অ্যানোফিলিস প্রজাতির ডিম অনেকটা চুরটের আকৃতির এবং দুই পাশে পানিতে ভেসে থাকার উপাদান রয়েছে। কিছু প্রজাতির পূর্ণঙ্গ নারী মশা তার জীবনচক্রে ১০০-২০০টি ডিম দিতে পারে। ডিমগুলি জলের উপরিভাগে পাড়া হয় এবং জলজ লার্ভা বা রিগলারের মধ্যে ফুটে থাকে, যা একটি ঝাঁকুনি, মুচমুচে নড়াচড়ার সাথে সাঁতার কাটে। বেশিরভাগ প্রজাতির মধ্যে, লার্ভা শেওলা এবং জৈব ধ্বংসাবশেষ খায়, যদিও কয়েকটি শিকারী এবং এমনকি অন্যান্য মশাকেও খাওয়াতে পারে। বেশিরভাগ পোকামাকড়ের বিপরীতে, পিউপাল পর্যায়ে মশা, যাকে টাঙ্কলার বলা হয়, সক্রিয় এবং মুক্ত সাঁতার কাটে। পিউপা বক্ষে টিউবের মাধ্যমে শ্বাস নেয়। প্রাপ্তবয়স্করা তাদের পিউপাল কেস থেকে বেরিয়ে আসার পরপরই সঙ্গম করে। জীবনচক্রের সময়কাল প্রজাতির উপর নির্ভর করে ব্যাপকভাবে পরিবর্তিত হয়।

শূক

মশার শূক খাবার উপযোগী মুখসহ সুগঠিত মাথা, পা-হীন বক্ষস্থল, ও বিভক্ত পেট থাকে। লাভা চারটি স্তরে বৃদ্ধি পেয়ে মুককীটে পরিণত হয়।

মুককীট

মশার মুককীট দেখতে কমা-আকৃতির। মাথা ও বক্ষস্থল পেটের সাথে বাঁকা হয়ে একত্রিত হয়। মুককীট তার পেটের সাহায্যে সাঁতার কাটতে পারে। বেশির ভাগ প্রজাতির মুককীটকে শ্বাস-প্রশ্বাস নেওয়ার জন্য প্রায়ই পানির উপরে আসতে হয়।

পূর্ণঙ্গ

প্রজাতি অনুযায়ী ডিম থেকে পূর্ণঙ্গ মশা হওয়ার সময়ের পার্থক্য দেখা যায়। বেশির ভাগ ক্ষেত্রেই পারিপার্শ্বিক তাপমাত্রার ব্যাপক প্রভাব থাকে। কিছু প্রজাতির ডিম থেকে পূর্ণঙ্গ মশা হতে সময় লাগে পাঁচ দিনের মত, কিন্তু বেশির ভাগ ক্ষেত্রে পূর্ণঙ্গ মশা হতে সময় লাগে ৪০ দিন বা কিছু প্রজাতির ক্ষেত্রে আরও বেশি। পূর্ণঙ্গ মশার শারীরিক আকৃতি শূকের ঘনঘন ও পানিতে খাদ্যের সরবরাহের উপর নির্ভর করে।

প্রধান জেনার এবং প্রজাতি



তিনটি ওরুহসূর্ণ মশার বংশ রয়েছে যা মানুষের মধ্যে রোগ সৃষ্টি করে।
অ্যানোফিলিস ম্যালেরিয়ার একমাত্র পরিচিত বাহক। এছাড়াও ফাইলেরিয়াসিস এবং এনসেফালাইটিস সংক্রমণ করে। অ্যানোফিলিস মশা সহজেই তাদের বিশ্রামের অবস্থান থেকে স্বীকৃত হয়, যেখানে প্রোবোসিস, মাথা এবং শরীর একে অপরের সাথে একটি সরল রেখায় কিন্তু পৃষ্ঠের কোণে থাকে। রঙিন আঁশের ফলে ডানায় দাগযুক্ত রঙ দেখা যায়। ডিম পাড়া সাধারণত ভারী গাছপালায় জলে ঘটে। স্ত্রী তার ডিম এককভাবে পানির পৃষ্ঠে জমা করে। অ্যানোফিলিস লার্ভা পানির পৃষ্ঠের সমান্তরালে অবস্থান করে এবং অন্যান্য মশার লার্ভার মতো, একটি টিউবের পরিবর্তে পেটের পিছনের শ্বাইরাকুলার প্লেটের মাধ্যমে শ্বাস নেয়। জীবনচক্র ১৪ দিন থেকে কয়েক সপ্তাহ পর্যন্ত।

কিউলেক্স মশা

বংশ কিউলেক্স ভাইরাল এনসেফালাইটিসের বাহক এবং গ্রীষ্মমন্ডলীয় এবং উপক্রান্তীয় জলবায়ুতে ফাইলেরিয়াসিসের বাহক। এটি তার দেহকে বিশ্রামের পৃষ্ঠের সমান্তরাল ধরে রাখে এবং এর প্রোবোসিসটি পৃষ্ঠের মাপক্ষে নীচের দিকে বাঁকানো থাকে। ডানা, শিরা এবং প্রান্তের উপর আঁশযুক্ত, রঙে অভিন্ন। নারীর পেটের অগ্রভাগ ভোঁতা এবং সারসি (মংবেদী উপাঙ্গ) প্রত্যাহার করেছে। দূষিত পানি সহ প্রায় যে কোন মিঠা পানির শরীরে ডিম পাড়ার ঘটনা ঘটতে পারে। পানিতে ভেসে থাকা ডিমগুলো 100 বা তার বেশি ভরে মিলিত হয়। লম্বা এবং সরু কিউলেক্স লার্ভাতে শ্বাস-প্রশ্বাসের টিউব থাকে যাতে চুলের টুকরো থাকে। এরা পানির পৃষ্ঠ থেকে 45° কোণে মাথা নিচের দিকে ঝুলিয়ে রাখে। জীবনচক্র, সাধারণত 10 থেকে 14 দিন, ঠান্ডা আবহাওয়ায় দীর্ঘ হতে পারে।

নর্দার্ন হাউস মশা (সি. পাইপিয়েন্স) হল উত্তরাঞ্চলে সর্বাধিক প্রাচুর্যপূর্ণ প্রজাতি, যখন দক্ষিণাঞ্চলীয় মশা (সি. কুইনকুইফাসিয়াটাস) দক্ষিণাঞ্চলে, যথা গ্রীষ্মমন্ডলীয় এবং উপক্রান্তীয় অঞ্চলে প্রচুর।

এডিস মশা

বংশ এডিস প্যাথোজেন বহন করে যা হলুদ স্বর, ডেঙ্গু, জিকা স্বর এবং এনসেফালাইটিস সৃষ্টি করে। কিউলেক্সের মতো, এটি তার শরীরকে বিশ্রামের পৃষ্ঠের সমান্তরাল ধরে রাখে, প্রোবোসিস নীচে বাঁকানো থাকে। ডানাগুলি অভিন্ন রঙের। এডিসকে কিউলেক্স থেকে আলাদা করা যেতে পারে এর রুশালী বক্ষের সাদা দাগ এবং পশ্চাদ্ভাগের সর্পিাকার ব্রিস্টল দ্বারা। নারীর পেটের অগ্রভাগ সূক্ষ্ম এবং সারসি প্রসারিত। এডিস সাধারণত বন্যার পানি, বৃষ্টির পুল বা লবণের জলাভূমিতে ডিম পাড়ে। ডিম দীর্ঘ সময়



গুরুত্ব সহ্য করতে সক্ষম। খাটো, শক্ত লার্ভাগুলির একটি শ্বাস-প্রশ্বাসের টিউব থাকে যাতে এক জোড়া টিউব থাকে এবং লার্ভাগুলি জলের পৃষ্ঠ থেকে 45° কোণে মাথা নিচু করে থাকে। জীবনচক্র 10 দিনের মতো ছোট হতে পারে বা, শীতল আবহাওয়ায়, কয়েক মাস পর্যন্ত দীর্ঘ হতে পারে।

ইজিস্টি . হলুদ জ্বরের জন্য দায়ী ভাইরাসের গুরুত্বপূর্ণ বাহক, এর পায়ে সাদা ব্যান্ড এবং পেটে এবং বক্ষে দাগ রয়েছে। এই গার্হস্থ্য প্রজাতি ফুলের পাত্রে থেকে বাতিল গাড়ির টায়ারের আবরণ পর্যন্ত প্রায় যেকোনো ধরনের পাত্রে বংশবৃদ্ধি করে ইস্টার্ন সল্ট মার্শ মশা (A. sollicitans), ব্ল্যাক সল্ট মার্শ মশা (A. taeniorhynchus), এবং গ্রীষ্মকালীন সল্ট মার্শ মশা (A. dorsalis) হল উপকূলীয় জলাভূমি অঞ্চলে গুরুত্বপূর্ণ মশা যারা প্রতিদিন বা মাঝে মাঝে লোনা বা লবণের বন্যা অনুভব করে। জল তারা প্রজননকারী , শক্তিশালী উড়ন্ত এবং মানুষ সহ প্রাণীদের জন্য বিরক্তিকর।

মশা নিয়ন্ত্রণ

যেহেতু মশাগুলি সংক্রামক রোগের এত বড় বাহক, তাই তাদের মানুষকে খাওয়ানো থেকে বিরত রাখা একটি মূল বিশ্ব স্বাস্থ্য কৌশল হিসাবে বিবেচিত হয়। মশা তাড়ানোর ওষুধ, হাত-পা ঢেকে রাখা লম্বা পোশাক, খোলা দরজা-জানালায় পর্দা এবং কীটনাশক-চিকিৎসামুক্ত মশার বিছানার জালের মাধ্যমে রোগ ছড়ানোর সম্ভাবনা কমানো যায়। মশার জনসংখ্যা আংশিকভাবে স্থায়ী জলের উত্স নির্মূল করার মাধ্যমে নিয়ন্ত্রণ করা যেতে পারে, যা মশার জন্য আদর্শ প্রজনন স্থান সরবরাহ করে। রিগলারের শ্বাস-প্রশ্বাসের টিউবগুলিকে আটকানোর জন্য স্থায়ী জলে তেলের একটি পৃষ্ঠতল ফিল্ম প্রয়োগ করা যেতে পারে, যা লার্ভিসাইড দ্বারাও মারা যেতে পারে। লার্ভিভোরাস মাছ ব্যবহার করে জৈবিক নিয়ন্ত্রণ, যেমন মশা মাছ (গ্যাম্বুসিয়া অ্যাফিনিস) জলের কিছু অংশের জন্য একটি বিকল্প। কখনও কখনও, কীটনাশকগুলি বাড়ির ভিতরে প্রাস্তবয়স্ক মশা ধ্বংস করতে ব্যবহার করা হয়।

কীটনাশকের বায়বীয় এবং ট্র্যাক-স্প্রে করার প্রয়োগগুলি সাধারণত শহরাঞ্চলে ব্যবহৃত হয়। পরাগায়নকারীদের উপর প্রভাব কমাতে এই ধরনের প্রয়োগগুলি প্রায়শই সন্ধ্যার প্রথম দিকে করা হয় এবং আদর্শভাবে, তারা কীটনাশক নিয়ে গঠিত যা ন্যূনতম অবশিষ্ট প্রভাব ফেলে, যদিও নিয়মগুলি বিশ্বজুড়ে ব্যাপকভাবে পরিবর্তিত হয়। এমনকি উন্নত দেশগুলিতে, বাণিজ্যিক গজ চিকিৎসাগুলি প্রায়শই পৌরসভার অ্যাপ্লিকেশনগুলির তুলনায় কম নিয়ন্ত্রিত হয় এবং জনসাধারণের দ্বারা ঘন ঘন অতিরিক্ত ব্যবহার করা হয়। লক্ষ্যহীন মাছি প্রজাতি এবং মৌমাছি সহ অনেক উপকারী পোকামাকড় প্রায়শই বিষুত বা অবিরাম কীটনাশক চিকিৎসার মাধ্যমে মারা যায়। মশা নিয়ন্ত্রণের জন্য ব্যবহৃত ন্যায়েড, পাইরেথ্রিনস, পাইরেথ্রয়েড এবং অন্যান্য সাধারণ কীটনাশক জলপথে প্রবেশ করতে পারে এবং জলজ অমেরুদণ্ডী প্রাণীদের ক্ষতি করতে



পারে. যা অ্যাম্লিকেশন সাইটের বাইরেও খাদ্য জালকে প্রভাবিত করে। প্রতিকূল আবহাওয়ায় মশার কীটনাশক ব্যবহার করা তাদের নেতিবাচক পরিবেশগত প্রভাবকে আরও বাড়িয়ে তুলতে পারে।

গবেষকরা কার্যকরী মশার বংশের উৎপাদন রোধ করতে মশার জনসংখ্যাকে হেরফের করার সম্ভাবনা অনুসন্ধান করেছেন. যার ফলে মশার সংখ্যা হ্রাস পায়। গবেষকরা এমন উপায়গুলিও চিহ্নিত করেছেন যাতে পুরুষ মশা তাদের বংশধরদের মধ্যে একটি জিন প্রেরণ করার জন্য জেনেটিকালি ইঞ্জিনিয়ার হতে পারে যা যৌন পরিপক্ব হওয়ার আগে সন্তানদের মৃত্যু ঘটায়। বিজ্ঞানীরা খুঁজে পেয়েছেন যে নিউরোট্রান্সমিটার অণু নিউরোপেপটাইড ওয়াই সম্পর্কিত ছোট যৌগের সংস্পর্শে এলে নারী মশারা মানুষের প্রতি কম আকৃষ্ট হয়। এই যৌগগুলি মশা প্রচুর পরিমাণে এমন জায়গায় ডিসপেনসারের মাধ্যমে নির্গত হতে পারে. যা মানুষকে কামড়ানো থেকে বিরত রাখতে সাহায্য করে।

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PROJECT TITLE: MEDICINAL PLANTS OF BANKURA DISTRICT
SUBJECT: ENVIRONMENTAL STUDIES (ACSHP/ 104/ AECC-1)
NAME: BAISAKHI MONDAL
PROGRAMME NAME: BENGALI (HONOURS)
CLASS: 1ST SEM
ROLL NO.: 2212007

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Medicinal Plants of Bankura District

Introduction:

Medicinal plants are just like other general plants though their uses are known by people, as people handling these since dates back and uses were traditional. Now the research and inventions indicating the active principles of the medicinal plants and the efficacy through applied field. Till date, the local medicine men and herbalists use these plants for medicinal purposes but the compensation and dose of the plant parts are different even the application time and dose vary from site to site. Perhaps, the deviation is due to large geographical variations with the variations of factors and traditional knowledge (TK) of different ethnic people over the globe. The morphological variations of species thus determining the efficacy of the selected plant is due to the change of phenology even the ingredients deposited by these plants due to climatic conditions. From temperate to subtropical even from coastal to arctic the plant and the plant products are varied. The same species grow in varied geographical habitats produce different degree or concentration of chemicals as phyto-chemicals. The dose and application formulations of these plant parts are varied as the use pattern and knowledge based data system is different. All the attributes purely governed by specific environmental factors. The size and shape of the geographical range of a species are a measure of its interaction with the specific environment in the area. It varies from one micro site to another site because of the limiting factors. No species can continually expand its area and sooner or later the range ceases to expand (Mani, 1995). Therefore, there is a change of specification of plant species which need immediate study. Southwest Bengal has tropical dry deciduous forest and many valuable medicinal plants which have been reported from these forests time to time. However, a very few attempts have been made to study the aspects on these medicinal plants in varied physiognomic characters to record the resources from taxonomy, ecology and conservation biology or from forestry. But indeed it is so tiny that a wide spectrum of such study is essential to know the scenario of Traditional Knowledge based conservation biology (TKBCB) to conserve the nature and natural resources in such degraded ecosystem. Remembering these themes in mind, some aspects of these much valuable medicinal plant species were studied from Southwest Bengal, India. Ecological status, botany and uses even survival of these medicinal plants of Southwest Bengal have been made. Therefore, the present study has been conducted to understand the actual scenario of medicinal plants grown in and around Southwest Bengal with a selective number of medicinal plant species.



Some widely used medicinal plants of Bankura district:

1. APANG:

Scientific Name: *Achyranthes aspera* L.

Family: Amaranthaceae

Vernacular Name: Apang, Apamarg (Bengali)

Botany: An erect annual or perennial herb with woody base, under shrub



Flowering and Fruiting: October to February **Medicinal Importance:** Entire plant used in various purposes. Used in dropsy, dyspepsia, dysentery, diseases of blood, piles, boils, eruption, colic (pain due to spasmodic contraction of the abdomen), gonorrhoea, pneumonia, ascities (abdominal dropsy); Leaf paste applied to stop bleeding, dried plant infusion given to cure burning sensation of urination of women; paste and long pepper is taken in case of dog bites, paste and kusum oil applied to cure sores on head, leg and ears of children. Fresh root is taken to cure allergy, root paste and worm water is given to women to stop bleeding after abortion, root ash with long pepper and country liquor made in to paste and given to women as contraceptive at the end of menstruation period. Dried seed powder with rice washing water to cure piles.

Distribution: Roadside hedges, waste places, shrubberies, bamboo garden, open tract of forest.

2. BASAK:

Scientific Name: *Adhatoda zeylanica*

Synonym: *Justicia adhatoda* L.

Family: Acanthaceae

Vernacular Name: Basak (Bengali),



Botany: Perennial shrub of common type.

Flowering and Fruiting: January to March

Medicinal Importance: Leaves used in rheumatism, piles, diarrhoea, dysentery, catarrh. Juice with honey used in chronic bronchitis, cold and cough. Paste with black pepper used to treat leucoderma. Dry leaves smoked in asthma. Flowers used in ophthalmia, bark used in acidity, indigestion, heart diseases.

Distribution: Roadside hedges, shrubberies, premises of villagers.

3. KALMEGH:

Scientific Name: *Andrographis paniculata*

Family: Acanthaceae

Vernacular Name: Kalmegh (Bengali)

Botany: Erect perennial herb.

Flowering and fruiting: October to March.



Medicinal



Importance: Used as bitter tonic, febrifuge and plant astringent. Extract is used in liver diseases and in dysentery. Usable parts are whole plants and leaves. Leaves: used to relieve griping, in case of irregular stools, loss of appetite; paste made into tablets and consumed to improve digestion and liver function. Roots: Given to children to cure general debility. Whole plant: Used in fever, general debility, dysentery, dyspepsia, soaked in water for a night and the water is taken in empty stomach to cure scabies, leprosy and whooping cough; improves liver functioning.

Distribution: In roadside shrubberies, waste places, occasionally at the villager's garden, floor of the forest, margin of streams, and river bed and canal side waste land with moderately high frequency of distribution.

4. SATAMULI:

Scientific Name: *Asparagus racemosus* Willd.

Family: Asparagaceae (=Liliaceae)

Vernacular Name: Satamuli, Satamul, Satavari (Bengali).

Botany: Perennial scandent undershrub. Stem spiny, woody. Roots tuberous, modified, narrow, elongated, fasciculated. Cladodes subulate, to 3 cm long, sulcate. Leaves scale like, 2.5 mm long. Flowers white, small, fragrant, numerous in racemes. Fruits globose berry, scarlet when ripe. Seeds black, ellipsoid globose.

Flowering and Fruiting: December to February



Medicinal Importance: Tuberous roots used in blood dysentery, haematuria, epilepsy, filarial, nocturnal emission, biliary colic, haematemesis, drying of mother's milk, aphomia, strangury. Paste applied on wounds, infusion to cure sunstroke and dysentery. Dried powder with goat milk acts as galactagogue. Dried powder with ghee given to children to improve eye sight. Leaves used to treat night blindness. Young shoot used in diabetes, dropsy, cardiac and urinary disorders.

Distribution: Inside the roadside hedges, forest hedges, shrubberies, in garden.

5. NAYANTARA:

Scientific Name: *Catharanthus roseus* (L.) G. Don.

Synonyms: *Vinca rosea* L., *Lochnera rosea* (L.) Reichb.

Family: Apocynaceae

Vernacular Name: Nayantara, Chirabasanta (Bengali).



Botany: Plant as perennial herb.



Medicinal Importance: entire plant: Juice taken in empty stomach to cure diabetes, used to treat diabetes mellitus, hypertension, leucorrhoea, leukemia, intestinal worms. Root paste applied to cure septic wounds, decoction and long peppers used to treat fever, again used to treat asthma and cancer. Leave juice taken in empty stomach in the morning to reduce high blood pressure mixed with water given to treat blood dysentery, given to babies in griping pain; warm leaf paste used to treat piles. Latex applied to cure cancerous wounds.

Distribution: In roadside, waste places, occasionally at the villager's garden as weed but frequently planted as ornamental one.

6. THANKUNI:

Scientific Name: *Centella asiatica* (L.)



Family: Apiaceae (Umbelliferae)

Vernacular Name: Thankuni, Manduki (Bengali)

Botany: Small, slender, creeping herb

Flowering and fruiting: March to May

Medicinal Importance: Leaves used in fatigue, bloodless, weakness, excessive sweating, constipation, indigestion, loss of memory, irregular menstruation, cold and cough, dysentery,



jaundice, fever, mouth ulcers, leprosy, and to improve glaze of the skin. It is used in insomnia, cardiac debility, epilepsy, asthma, abdominal disorder and in fever.

Distribution: In marshy places.

7. PATHARKUCHI:

Scientific Name: *Kalanchoe pinnata* (L. am.)



Family: Crassulaceae

Vernacular Name: Patharkuchi (Bengali)

Botany: Erect succulent herb

Flowering and Fruiting: January to March

Medicinal Importance: Leaves used to treat diabetes, cold, cough, urinary troubles, haematemesis, indigestion, colic in children, hysteria. Fresh crushed leaves taken once daily to treat tumour. Juice taken for flatulence.

Distribution: Roadside, forest hedges, shrubberies, grassland, sand dunes etc.

8. PUDINA:

Scientific Name: *Mentha piperita* L.

Family: Lamiaceae (Labiatae)

Vernacular Name: Pudina, Mentha (Bengali)

Botany: Erect annual herb.

Flowering and Fruiting: Not seen



Medicinal Importance: Carminative, gastric stimulant, antiseptic, stomachic, used in nausea, flatulence, cold, cough, sickness, vomiting, local pains, headache, menstrual colic.

Distribution: In roadside shrubberies, waste places.

Conclusion:

Medicinal plants are extremely useful for folk communities as human and ethnoveterinary medicine. Tribal people collect the medicine from their own localities when they grow medicinal plants at their own homesteads. As a result of no severe side effect and very low cost the herbal medicines have become very popular in urban areas throughout the world. These are become very useful especially in treating the day to day common ailments. There should be assessment of medicinal properties even of plants growing in and around the residences. So that they can be used for health care. Thus it is encouraging to find growth of human interest in medicinal plants and their sustenance both rural and urban areas as well as laboratories. Proper identification of the species is absolutely necessary failing which may lead to casualty including death. For this involvement of taxonomist is always necessary. Application of appropriate taxonomic tool for identification followed up by clinical investigations and therapeutic proving of the herbal folklore plants can handover novel herbal medicines for health care.



Acknowledgment:

I would like to thank my teachers Debraj sir and Anjit sir for their guidance and motivation. I am also thankful to the other teachers of the college, my parents and friends. After completing this project, I have acquired knowledge on various medicinal plants which grow in Bankura district, West Bengal.

Baisakhitondel.
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Students' Signature

Debraj Das 5/11/22
.....

Teacher's signature

EXAMINED
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Degree College
Mejia, Bankura



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DEGREE COLLEGE

PROJECT TITLE: ENVIRONEMT POLLUTION
SUBJECT: ENVIRONMENTAL STUDIES (ACSHP/ 104/ AECC-1)
NAME: BEAUTY LAYEK
PROGRAMME NAME: PHILOSOPHY (HONS.)
CLASS: 1ST SEM
ROLL NO.: 2217052

Debnaj Das 5/11/22
EXAMINED
Kabi Jagadram Roy Govt. General
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পরিবেশ দূষণের কারণ, ফলাফল ও প্রতিরোধ

□ পরিবেশ ঃঃ আমাদের গণসংস্কৃতি জাহালা, মাটি, অক্ষয়িত, জল, মানুষজন পাশাপাশি অবিচ্ছিন্ন অক্ষয়িত অংশ-অংশে হল পরিবেশ। জীবে সংস্থা পরিবেশের অক্ষয়িত যে রয়েছে তাতে অক্ষয়িত বণ্ডা যায না। তাই সুস্থ ওতে প্রত্যাশার অক্ষয়িত ওতে প্রত্যাশার জন্য বিচ্ছিন্ন পরিবেশের অক্ষয়িত প্রয়োজন যন্ত্র অক্ষয়িত সুত উন্নতিত ফলে মানব অক্ষয়িত জীবিত সুস্থ স্বাধীনতা ও অক্ষয়িত রূপে অক্ষয়িত পেয়েছে। অক্ষয়িত প্রাকৃতিক বিচ্ছিন্নতা নষ্ট হয়েছে এই প্রকৃতিতে ও অক্ষয়িত পরিবেশ দূষণ নামে অক্ষয়িত বণ্ডি পরিবেশ দূষণের কারণে মানব অক্ষয়িত ওতে অক্ষয়িত সুখোন্মুখি। সুত জনসংখ্যার বৃদ্ধি ওতে বিচ্ছিন্নতা নির্ভর প্রাকৃতিক প্রাকৃতিক অক্ষয়িত সুখিত ওতে ওনা হলো অক্ষয়িত অক্ষয়িত ও নান্দিত্যে অক্ষয়িত অক্ষয়িত পক্ষে ও বিচ্ছিন্নতা। নির্ভর প্রকৃতি অক্ষয়িত ওতে বণ্ডিজননীন দূষণ সুখিত ওতে ওনাছে অক্ষয়িত ও অক্ষয়িত অক্ষয়িত।

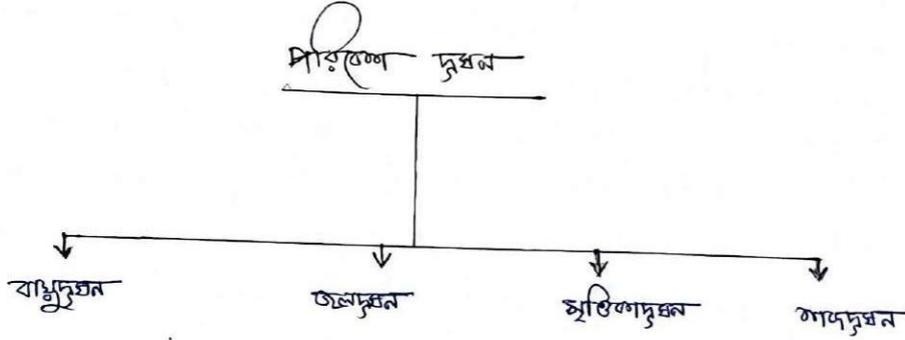
□ দূষণের কারণ ও ঃঃ পরিবেশ দূষণের কারণে বিনষ্ট হয়। অক্ষয়িত জীবজন্তুর স্বাভাবিক প্রাকৃতিক বিনষ্ট হয়। অক্ষয়িত জীবজন্তুর স্বাভাবিক ওতে অক্ষয়িত বিচ্ছিন্নতা বৃদ্ধি হয়। অক্ষয়িত জীবজন্তুর স্বাভাবিক ওতে অক্ষয়িত পরিবেশ দূষণের বৃদ্ধি অক্ষয়িত ওতে অক্ষয়িত হয়। অক্ষয়িত প্রাকৃতিক দূষণের হল অক্ষয়িত অক্ষয়িত অক্ষয়িত দাখানল, পাঠ্যক্রমে অক্ষয়িত প্রকৃতিবিশেষে পরিবেশ দূষণ হয়। কিন্তু অক্ষয়িত দূষণ অক্ষয়িত। যান অক্ষয়িত বীমা, অক্ষয়িত অক্ষয়িত দূষণ অক্ষয়িত পাঠ্যক্রমে পরিবেশ দূষণ, বিনষ্ট অক্ষয়িত অক্ষয়িত অক্ষয়িত প্রকৃতি অক্ষয়িত পরিবেশ।

P.T.O



আগের দুই সপ্তাহ যাবে চলেছে। পারিভ্রমিক দুই সপ্তাহ প্রদান করা হয়েছে। অতীত

- এক - (১) বায়ুদূষণ।
(২) জলদূষণ।
(৩) শ্রুতিগত দূষণ।
(৪) শব্দ দূষণ।





6

উল্লেখিত বিষয়ের যোগাযোগ

উল্লেখিত জল (মাগ) বিভিন্ন বর্ণের জলবাহিত স্ফটিকের দ্বারা
যেমন ক্যালসিয়াম, অক্সিজেন, অক্সিজেন প্রভৃতি। জলের মাধ্যমে দ্রবিত পদার্থ
আমাদের স্বাস্থ্যে অস্বস্তি হলে বিভিন্ন বর্ণের পানিতে ভেজা, ক্যানসার ও পানির
কঠিন বস্তু অত্যন্ত সূক্ষ্ম হয়। এছাড়া জল দূষণ ঘনিত বস্তুতে
জলসমূহ অতিরিক্ত সূক্ষ্ম উপাদান সূক্ষ্ম মাটির দূষণের অংশে অতিরিক্ত
সূক্ষ্ম হলে জলে জলজ জীবাণু হারিয়ে যায় এবং ফলস্বরূপ স্বাস্থ্যের
ক্ষতি ঘটে। এছাড়া জলের সূক্ষ্মতা বন্ধে যায়, অতিরিক্ত পানিতে সূক্ষ্ম
পদার্থ দ্বারা বিয়োজন হওয়া সূক্ষ্ম পানি বলে জলের অস্বস্তি ও অস্বস্তি
ব্যস্ত হয় অস্বস্তির ফলে জলসমূহ হার ও অন্যান্য
সূক্ষ্ম পানি সূক্ষ্ম হলে বিভিন্ন জাতের সূক্ষ্ম পানি থেকে
স্বাস্থ্যের উপাদান হলে এই সূক্ষ্ম পানি পানি, মাছ, মিল্ক,
ও অন্যান্য জলজ পানির সূক্ষ্ম হলে এছাড়াও দ্রবিত জল হলে
বস্তু প্রভৃতি বস্তুতে অন্যান্য উপাদান বস্তু হওয়া ও জীবাণু হলে
হয়, ফলে স্বাস্থ্যে অস্বস্তি পানি হলে ও স্বাস্থ্যে অস্বস্তি হলে


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শ্রীশ্রীশ্রী মুখ্যমন্ত্রীর সম্বোধন

অতিশয় অত্যন্ত সুকৃষ্ণদীন তিনি উপাদান হয়ে ছোট পানি এবং
যদিও এটি উপাদানগুলি অনির্দিষ্ট হলে স্বাভাবিক উচ্চ-মাত্রার
সম্প্রদায়িক। কিন্তু বর্তমানে আর্জেন্টানা বানা হাতে দুর্ভাগ্য হয়ে
যেহেতু দেখা দিচ্ছে নানান অস্বাভাবিক ঘটনা। যেমন দুর্ভাগ্য আর্জেন্টানা
অস্বাভাবিক মাদ্য হিসাবে খেল মানুষ ব্যাভাবিক অস্বাভাবিক মনে
দুর্ভাগ্য আর্জেন্টানা জাদুঘর না হলে মাধ্যমিক অস্বাভাবিক ঘটনা
দেখা যায়, আর্জেন্টানা উদ্ভিদে উদ্ভিদে ব্যাভাবিক বসবাসের হয়ে পড়ে।
আর্জেন্টানা হলে দুর্ভাগ্য উদ্ভিদে দুর্ভাগ্য পান্য অস্বাভাবিক উদ্ভিদে
কি বর্তমানে জাদুঘর জাদুঘর জাদুঘর মাধ্যমিক অস্বাভাবিক উদ্ভিদে
ঘটনা উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে
বর্তমানে উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে
এই পক্ষ মাধ্যমিক আর্জেন্টানা উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে
আর্জেন্টানা যদি উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে
দুর্ভাগ্য উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে উদ্ভিদে


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কবি দুর্ঘটনা

সাহিত্যের দুর্ঘটনা একটি দিগন্তহীন ক্ষেত্র। জনসমূহের জীবনযাত্রায় এবং, জ্ঞান, চিন্তা, শিক্ষা, চলাচল ও শ্রমের ক্ষেত্র জুড়ে কবিরা কখন কখন কবিদের আত্মজীবনী-সম্বন্ধে বিবরণ দিতে গিয়ে, উচ্চাকাঙ্ক্ষা নাহলে লাইফ অফ কবিরা হুলিভেট হয়ে যায়, শিক্ষা, বিজ্ঞান ইত্যাদি ক্ষেত্রের ব্যক্তিগত ক্ষেত্র জুড়ে কবিরা কখন কখন উচ্চাকাঙ্ক্ষা নাহলে লাইফ অফ কবিরা হুলিভেট হয়ে যায়। এই ক্ষেত্রের এই ক্ষেত্রগুলিতে আলাদাভাবে বলা হলেও যুক্তিতে অসুবিধা হয়। বিশেষতঃ অসুবিধিত আছে আছে অসুবিধিতও অসুবিধিত বিবর্তিত হয়, যা আমাদের সাহিত্যের মাধ্যমে সৃষ্টি করে অসুবিধিত গিয়ে যায় ও অসুবিধিত সৃষ্টিতে বিজ্ঞান-সম্বন্ধে অসুবিধিত অসুবিধিত; আইন, অসুবিধিত সৃষ্টি হলেও অসুবিধিত সৃষ্টি সাহিত্যের ক্ষেত্রগুলিতে আছে আছে কবিদের হয় এ অসুবিধিত বাস্তবগুলিতে আছে আছে কবিদের হয় ও সাহিত্যের দুর্ঘটনা সৃষ্টি।





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DEGREE COLLEGE**

PROJECT TITLE- STUDY OF A LOCAL TREE: BANYAN TREE
SUBJECT- ENVIRONMENTAL STUDIES (ACSHP/ 104/ AECC-1)
NAME- CHINTAHARAN MAJI
PROGRAMME NAME- Bengali (Programme)
CLASS- 1ST SEM
ROLL NO.- 2210062
YEAR- 2022-23

Debraj Das 5/11/22
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একটি সাধারণ উদ্ভিদের অধ্যয়ন: ভারতের জাতীয় বৃক্ষ বটগাছ

একটি দেশের জাতীয় বৃক্ষ হল গর্বের প্রতীক, যা জাতির পরিচয়ের একটি অবিচ্ছেদ্য অংশ। বটগাছ (Ficus benghalensis) হল ভারতের জাতীয় বৃক্ষ (National Tree of India)। এই বৃক্ষটি হিন্দু দর্শনে পবিত্র হিসাবে সম্মানিত। এই গাছটি অনেকবেশি কাণ্ড এবং শাখার জন্ম দেয়। এই বৈশিষ্ট্য এবং তার দীর্ঘায়ু কারণে, এই গাছটি অমর হিসাবে বিবেচিত হয় এবং এটি ভারতের পৌরাণিক কাহিনী এবং কিংবদন্তীর একটি অবিচ্ছেদ্য অংশ। গাছটিকে প্রায়শই 'কল্প বৃক্ষ' বা 'কামনা পূর্ণতার বৃক্ষ' -এর প্রতীক হিসাবে গণ্য করা হয়, কারণ এটির দীর্ঘায়ু রয়েছে এবং এর গুরুত্বপূর্ণ ঔষধি গুণাবলী রয়েছে। বহু শতাব্দী ধরে বটগাছটি ভারতের গ্রাম্য সম্প্রদায়ের জন্য একটি গুরুত্বপূর্ণ বিষয়। আজও, বটগাছ গ্রাম জীবনের কেন্দ্রবিন্দু এবং গ্রাম পরিষদ এই গাছের ছায়ায় মিলিত হয়।

বটবৃক্ষ: ধর্ম ও পুরাণ অনুসারে তাৎপর্য

অনেক এশীয় এবং প্রশান্ত মহাসাগরীয় গল্প এবং ধর্মে বটগাছ বিশিষ্টভাবে অন্তর্ভুক্ত রয়েছে, যার মধ্যে রয়েছে:

- বৌদ্ধধর্মের পালি ক্যাননে বটবৃক্ষের অনেক উল্লেখ পাওয়া যেতে পারে।
- মিড-অটাম ফেস্টিভালের ভিয়েতনামী পুরাণে, চাঁদের অঙ্ককার চিহ্নগুলি হল একটি বট, একটি যাদুকরী গাছ প্রাথমিকভাবে পৃথিবীতে কুওই নামে একজন ব্যক্তি রোপণ করেছিলেন। লোকটি গাছে ঝুলছিল তখন তার স্ত্রী নোংরা পানি দিয়ে পানি দিল। তারপর গাছটি নিজেই উপড়ে পড়ে এবং চাঁদে উঠে যায়, যেখানে সে এখন মুন লেডি এবং জেড র্যাবিটের সাথে অভ্যন্তরীণভাবে থাকে।
- এগুলি ফিলিপাইনে বালেতে গাছ হিসাবে পরিচিত এবং কিছু দেবতা এবং আত্মার বাসস্থান।
- এগুলি ফিলিপাইনে বালেতে গাছ হিসাবে পরিচিত এবং কিছু দেবতা এবং আত্মার বাসস্থান।
- ওকিনাওয়াতে গাজুমারু নামে পরিচিত গাছটিকে স্থানীয় লোককাহিনীতে কিজিমুনোর আবাস বলে বলা হয়।
- ওয়ামের চামোরো জনগণ তাওতাওমোনা, ডুয়েন্ডেস এবং অন্যান্য আত্মা জড়িত কিংবদন্তিতে বিশ্বাস করে। বটবৃক্ষ প্রাচীন চামোরো প্রফুল্লতা দ্বারা সুরক্ষিত তাওটাওমোনা নামে পরিচিত।



হিন্দু ধর্মে বটগাছ

হিন্দু ধর্মে বটগাছকে পবিত্র বলে মনে করা হয় এবং একে বলা হয় "অমৃত বৃক্ষ" ("আমি গাছের মধ্যে বটগাছ"- ভগবদ গীতা)। এটির স্রমবর্ধমান শাখার জন্য এটিকে শান্ত জীবনের প্রতীক হিসেবে মনে করা হয়। হিন্দুধর্মে, গাছটিকে ভগবান ব্রাহ্মণ, ভগবান বিষ্ণু এবং ভগবান মহেশ্বরের প্রতীকী প্রতিনিধিত্ব হিসাবে বিবেচনা করা হয়।

- বটগাছকে কল্পবৃক্ষও বলা হয় যার অর্থ 'ইচ্ছাপূরণকারি ঐশ্বরিক বৃক্ষ'।
- ব্রাহ্মণ অনডিস তার উপন্যাস হটহাউসে ভবিষ্যতের পৃথিবীর বর্ণনা করেছেন যেখানে একটি বিশাল বটগাছ পৃথিবীর অর্ধেক জুড়ে রয়েছে।
- আংকর ওয়াট মন্দির কমপ্লেক্সের টা প্রহম তার চারপাশে এবং তার দেয়ালের মধ্য দিয়ে বেড়ে ওঠা বিশালাকার বটগাছের জন্য সুপরিচিত
- পুরানো গাছগুলি বিহ্বত এলাকা জুড়ে এই প্রশ শিকড়গুলি ব্যবহার করে অনেক দূর পর্যন্ত ছড়িয়ে পড়তে পারে।
- এই ধরনের সবচেয়ে বড় গাছ এখন ভারতের কলকাতায় পাওয়া যায়। 1873 সালে হাওয়াইয়ের লায়হিনা কোর্টহাউস স্কয়ারে একটি বিখ্যাত বটগাছ রোপণ করা হয়েছিল এবং এখন এটি এক একরের দুই তৃতীয়াংশ জুড়ে পরিণত হয়েছে।



বট বাংলা অঞ্চলের আদিমতম বৃক্ষ। বট গাছকে ঘিরে বাংলা অঞ্চলের রয়েছে শত-সহস্র বছরের ঐতিহ্য। উষ্ণ আবহাওয়ায় বিশাল আয়তনের এই ছায়াবৃক্ষটি অনেক উপকারে আসে। প্রাচীনকাল থেকেই বটবৃক্ষের ছায়ায় হাট-বাজার বসে, মেলা হয়, লোকগানের আসর বসে, জনসভা হয়। কারণ হিসেবে বলা যায়, বাংলার গ্রামাঞ্চলে বড় বড় সূশীতল হলরুম নেই। আর তাই বড় বড় অনুষ্ঠান ও জনসভাগুলো ছায়াসুনিবিড় বটতলায় অনুষ্ঠিত হয়ে থাকে। এই গাছকে ভারতে পবিত্র হিসেবে বিবেচনা করা হয়, এবং প্রায়ই এই গাছের নিচে মন্দির বানানো হয়। ভারতের বিভিন্ন অঞ্চলসহ দক্ষিণ এশিয়ার কয়েকটি দেশে ধর্মীয় কারণে বট গাছ কাটা নিষিদ্ধ। এ গাছের উপকারিতা ও ধর্মীয় গুরুত্বের কারণে বট গাছ ভারতের জাতীয় বৃক্ষ হিসেবে মর্যাদা লাভ করেছে।

ঐতিহাসিক বটগাছ

- ভারতের অন্ধ্র প্রদেশ রাজ্যের কাদিরি থেকে প্রায় ৩৫ কিলোমিটার দূরে অনন্তপুরের কাছে খিম্বামা মারিমানু নামে একটি বটগাছ রয়েছে। ভারতীয় বোটানিক্যাল গার্ডেনে পাওয়া যাবে, যেখানে এটি 550 বছরেরও বেশি সময় ধরে বৃদ্ধি পাচ্ছে এবং একটি 19,107 m2 ছাউনি রয়েছে (4.721 একর)
- দ্য গ্রেট বেনিয়া, অন্যতম উল্লেখযোগ্য গাছ, কলকাতা, ভারতে অবস্থিত হতে পারে। এটি 250 বছরেরও বেশি পুরানো এবং 4.67-একর পদচিহ্ন রয়েছে।
- এরকম আরেকটি গাছ, ডোড্ডা আলাদা মারা, যা প্রায়ই "বড় বটবৃক্ষ" নামে পরিচিত, এটি বেঙ্গালুরুর বাইরে প্রায় 2.5 একর জায়গার ভারতীয় গ্রাম রামোহানিতে অবস্থিত হতে পারে।
- হাওয়াইয়ের ইওলানি প্রাসাদে বানান। 1880-এর দশকে রানী কাপিওলানি ইওলানি প্রাসাদের মাঠে দুটি বটগাছ রোপণ করেছিলেন। প্রাক্তন ঐতিহাসিক প্রাসাদের মাটিতে এই গাছগুলি যথেষ্ট গুচ্ছে বেড়েছে।
- উইলিয়াম ওয়েন স্মিথ 1873 সালে হাওয়াইয়ের মাউইতে লাহাইনার কোটহাউস স্কোয়ারে বটগাছটি রোপণ করেছিলেন। এটি দুই-তৃতীয়াংশ-একর এলাকা দখল করে বিস্তৃত হয়েছে।
- কল্লাবতা, একটি বিশাল বটগাছ, পুরীর জগন্নাথ মন্দিরের মাঠে অবস্থিত। এটি অনুগামীদের দ্বারা পবিত্র বলে মনে করা হয় এবং 500 বছরেরও বেশি পুরানো বলে মনে করা হয়।
- লেগোল্যান্ডে সাইপ্রস গার্ডেনে একটি বিশাল বটগাছ রয়েছে ফ্লোরিডার উইন্টার হ্যাভেনে থিম পার্ক। এটি 1939 সালে 5-গ্যালন পাত্রে বপন করা হয়েছিল।



বটগাছের বৈশিষ্ট্য

অন্যান্য ডুমুর প্রজাতির মতো, বটগাছের "সিকোনিয়াম" নামে পরিচিত একটি কাঠামোতে তাদের ফল উত্পাদন করে। ফিকাস প্রজাতির সিকোনিয়ামে ডুমুর মাছের পোকা খাবার এবং আশ্রয় খুঁজে পায় এবং গাছগুলি তাদের পরাগায়নের জন্য মাছের উপর নির্ভর করে। মৃদুভোজী পাখিরা বটের বীজ ছড়িয়ে দেয়। বীজগুলি ক্ষুদ্র, এবং যেহেতু বেশিরভাগ বটবৃক্ষগুলি বনভূমিতে পাওয়া যায়, তাই একটি চারা যা মাটিতে অঙ্কুরিত হয় তার বেঁচে থাকার সম্ভাবনা কম। যাইহোক, অনেক বীজ অন্যান্য গাছ বা কৃত্রিম কাঠামোর কান্ড এবং শাখায় অবতরণ করে। যখন তারা অঙ্কুরিত হয়, তখন তারা শিকড় গজায় যা বাইরের দিকে ছড়িয়ে পড়ে এবং অবশেষে হোস্ট গাছ বা সিস্টেমের একটি অংশকে ঘিরে ফেলতে পারে। এই আচরণটিকে "স্ট্র্যাংলার" হিসাবেও উল্লেখ করা হয়, বিভিন্ন গ্রীষ্মমন্ডলীয় ফিকাস প্রজাতির দ্বারা ভাগ করা হয় এবং ক্লিসিয়া এবং মেটোসিডেরোস সহ সম্পর্কহীন জেনার থেকে বেশ কয়েকটি প্রজাতি। বটগাছের চওড়া, উপবৃত্তাকার, চামড়াযুক্ত, চকচকে, সবুজ পাতা এবং দুটি বড় আঁশ রয়েছে যা বেশিরভাগ ডুমুরের পাতার কুঁড়িকে রক্ষা করে। পাতার বৃদ্ধির সাথে সাথে আঁশ বিলুপ্ত হয়ে যায়। ফলস্বরূপ, কচি পাতায় একটি সুন্দর লাল রঙের আভা থাকে। পুরানো বটগাছগুলিকে তাদের প্রথম শিকড় দ্বারা চিহ্নিত করা যেতে পারে, যা ঘন, কাঠের কাণ্ডে বিকশিত হয় যা সময়ের সাথে সাথে মূল কাণ্ডের সাথে সাদৃশ্যপূর্ণ হতে পারে। এই সমর্থনকারী শিকড়গুলি বয়স্ক গাছগুলিকে বিস্তৃত অঞ্চল জুড়ে পানীয়ভাবে বৃদ্ধি পেতে সক্ষম করে। কিছু প্রজাতির শিকড় একটি বিশাল অঞ্চলে বৃদ্ধি পায় যা গাছের গোড়ের মতো, প্রতিটি কাণ্ড প্রত্যক্ষ বা পরোক্ষভাবে প্রধান বগিতে সংযুক্ত থাকে। শ্রেণিবদ্ধ কম্পিউটার নেটওয়ার্ক অপারেটিং সিস্টেম এই বিশাল রুট সিস্টেমের টপোলজি থেকে এর নাম নেয়। শিকড়ের জাল যা একটি বটগাছের চারপাশে তৈরি হয় যা এটিকে আবৃত করে অবশেষে এটির উপর উল্লেখযোগ্য চাপ সৃষ্টি করে এবং প্রায়শই এটিকে মেরে ফেলে। ঘেরা এবং মারা যাওয়ার কারণে শেষ পর্যন্ত বটগাছটি একটি ফাঁপা কেন্দ্রীয় কোর সহ একটি "কলামার গাছ" তে পরিণত হয়। এই ধরনের ফাঁপা জঙ্গলে অনেক প্রজাতির জন্য অত্যন্ত পছন্দের বাড়ি।

বটের পাতা একান্তর, ডিম্বাকৃতি, মসৃণ ও উজ্জ্বল সবুজ। কচি পাতা তামাটে। স্থান-কাল-পাত্রভেদে পাতার আয়তনের বিভিন্নতা একাধারে বটের বৈশিষ্ট্য তথা প্রজাতি শনাক্তকরণের পক্ষে জটিলতার কারণও। পরিণত গাছের পাতা আকারে কিছুটা ছোট হয়ে আসে। বটের কুঁড়ি পাংশুটে হলুদ এবং এর দুটি স্বল্পায়ু উপপত্র পাতা গজালোর পরই ঝরে পড়ে। খুব অল্প বয়স থেকেই বট গাছের



ঝুরি নামতে শুরু করে। মাটির সমান্তরালে বাড়তে থাকা ডালপালার ঝুরিগুলো একসময় মাটিতে গেঁথে গিয়ে নিজেরাই একেকটা কান্ডে পরিণত হয়। এভাবেই বট গাছ ধীরে ধীরে চারপাশে বাড়তে থাকে এবং একসময় মহীরুহে পরিণত হয়। বসন্ত ও শরৎ বট গাছে নতুন পাতা গজালোর দিন। এসময় কচি পাতার রং উজ্জ্বল সবুজ থাকে। গ্রীষ্ম-বর্ষা-শীত হলো ফল পাকার সময়। এটি চিরহরিৎ সাইকাস বহুবর্ষজীবী গাছ।

বটগাছ: থেবাপিউটিক বৈশিষ্ট্য

নেপালের লোকেরা বটের শিকড়, পাতা এবং বাকল ব্যবহার করে বিভিন্ন ধরণের অসুস্থতা এবং স্বাস্থ্য সমস্যাগুলির চিকিতসা করুন, যেমন:

- ডায়রিয়ার চিকিৎসা: কচি কচি পাতা পানিতে ভিজিয়ে রেখে আপনি একটি অ্যাস্ট্রিনজেন্ট তৈরি করতে পারেন যা জিআই ট্রান্সট মেরামত এবং প্রদাহের জন্য উপকারী।
- দাঁতের শিকড় চিবিয়ে খেলে মাড়ির রক্ত পড়া, দাঁতের ক্ষয় এবং মাড়ির রোগ বন্ধ হয়। বীজ শ্বাস-প্রশ্বাস দূর করতে সাহায্য করে এবং প্রাকৃতিক টুথপেস্টের মতো কাজ করে। মূলের শোধনকারী বৈশিষ্ট্যগুলি বেশিরভাগ মৌখিক স্বাস্থ্য উদ্বেগ প্রতিরোধ এবং চিকিতসা করতে সহায়তা করে।
- রোগ প্রতিরোধ ক্ষমতা বৃদ্ধিকারী: বটগাছের বাকল রোগ প্রতিরোধ ক্ষমতার একটি নির্ভরযোগ্য উৎস।
- গাছের রসে প্রদাহ-বিরোধী প্রভাব রয়েছে এবং এটি আর্থ্রাইটিসের চিকিৎসায় ব্যবহৃত হয়। এটি প্রদাহ কমায়।
- বিষমত্তা দূর করে: বলা হয় বটগাছের ফল থেকে নির্যাস মস্তিষ্কে সেরোটোনিনের মাত্রা বাড়ায়।
- কোলেস্টেরল কমায়: আমাদের শরীরে "ভাল" এবং "খারাপ" উভয় কোলেস্টেরল থাকে। বটগাছের বাকল কার্যকরভাবে খারাপ কোলেস্টেরল কমায় ভাল কোলেস্টেরল একটি উচ্চ পরিমাণ বজায় রাখার সময়।
- উচ্চ রক্তে শর্করা -ডায়াবেটিসের চিকিত্সার জন্য শিকড়গুলিকে মিশ্রিত করা যেতে পারে।



উপসংহার: এই প্রজেক্টের মাধ্যমে আমরা বট গাছের ঐতিহাসিক ও পৌরাণিক ইতিহাস চর্চা করেছি। এর সাথে বট গাছের আয়ুর্বেদিক গুরুত্ব আমরা অনুধাবন করতে পেরেছি। এই প্রজেক্ট সম্পূর্ণ করার জন্য আমরা দেবরাজ স্যার ও অরিজিৎ স্যারের কাছে কৃতজ্ঞতা জ্ঞাপন করি। এছাড়াও আমার বন্ধু এবং অন্যান্য শিক্ষক-শিক্ষিকাদের ধন্যবাদ জানাই।

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05/11/22



**KABI JAGADRAM ROY GOVT.
GENERAL DEGREE COLLEGE**

PROJECT TITLE: BUTTERFLY SPECIES OF MEJIA

**SUBJECT: ENVIRONMENTAL STUDIES (ACSHP/ 104/
AECC-1)**

NAME: PRITI KANA DUBEY

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Topic: Butterfly Species of Mejia

The butterflies are one of the most visible and functional species in the ecosystem. Butterflies belong to Lepidoptera or scaly-winged insects (lepidos = scales and pteron = wings in Greek). Butterflies have fine scales on their wings that look like fine powder. These scales are colored and result in giving striking colors and patterns to many butterflies while providing cryptic colors and camouflage patterns to others. When touched by humans, the wings tend to lose some scales. If too many scales are lost, the butterfly's ability to fly will be impaired. The scales on the butterfly wings have many properties, mostly optical, that interest scientist. The patterns they make are also seen as the best animal system for understanding the developmental and genetic processes that produce morphological variation in nature. Butterflies have been used as model organisms for a variety of fields of study, spanning ecology, evolutionary biology, and conservation biology.

Life Cycle of a Butterfly

The life cycle of a butterfly can be discussed in four stages in detail. All the butterflies have complete metamorphosis. To grow into an adult, they go through four stages - egg, larva, pupa, and adult. Every stage has different goals to achieve like caterpillars need to eat a lot and adults need to reproduce. The life cycle of the butterfly may depend on the type of butterfly; it might take from a month to a whole year. Metamorphosis is the process where butterflies' life cycle depends on. Metamorphosis, which means transformation or change in shape, is a very lengthy process. There are two types of metamorphosis, first complete metamorphosis and second incomplete metamorphosis. Some common insects like dragonflies and cockroaches go through incomplete metamorphosis. But insects like butterflies and moths go through the complete metamorphosis process. The butterflies' life cycle is divided into four parts: egg, larva, pupa, and adult.

First Stage: Egg The first stage of the butterfly is the egg from where a butterfly starts its life. The different types of eggs are small, round, oval, or cylindrical. The shape of the egg depends on the type of butterfly. The special thing about butterfly eggs is that you can see the tiny caterpillar growing inside of it. If you look closely, especially at monarch caterpillars. The eggs of the butterfly are usually laid on the leaves of plants. First, the female butterflies laid eggs on plants. By the time these plants are changed into foods for the newborn larva. Spring and summer are the best time or climates to lay eggs for female butterflies. It also



varies on the species of that female butterfly. Female butterflies could lay a vast number of eggs at one time. But in the end, some of them can survive. In size and shape, butterfly eggs are tiny.

2 □ Second Stage: Caterpillar, The Larva The larva is the next stage. It is also named a caterpillar. The main thing that caterpillars do is eat. Larvas stored this food for the future and used it to get an adult. At that time, it grows up, splits its skin, and sheds it four 4 to 5 times. It grows up to 100 times on this stage. Also, the larva size grows up to 2 inches long in several weeks. The second stage of the butterfly life cycle is the larva. Butterfly larva is one which is called a caterpillar, the butterfly does not remain in this stage for a long time, in this stage all they do is to eat. An egg of the butterfly once hatched, the caterpillar will start to do his work to eat the leaf they were born on. So, it is very important for mother butterflies to lay an egg on the leaf which caterpillars can eat. The different caterpillars eat different types of leaves, so, it is very important to lay an egg on the kind of leaf the caterpillar prefers to eat because the caterpillar cannot travel to a new plant. The main purpose of the caterpillar is to eat as much as it can and grow quickly. When the caterpillar is born, it is extremely small and when they start eating, they start growing and expanding instantly.

□ Third Stage: Pupa, The Transition Stage The third stage of the butterfly is the pupa. It is one of the coolest stages of butterfly life. Once the caterpillar is grown fully to its full length and weight, they form themselves into a pupa, also known as a chrysalis. Caterpillars change rapidly inside of the pupa, their remarkable transformation called metamorphosis. In this transformation, the caterpillar is transformed into a butterfly by changing tissue, limbs and organs of the caterpillar. Caterpillars stop eating after being grown. Now it's transformed into a pupa. The pupa of butterflies is known as a chrysalis. A cocoon of silk covers the pupa. This stage can take more than a week or a month. These original larva cells provide lots of energy to the growing adult cells at this stage.

Fourth Stage: Adult, The Reproductive Stage The fourth stage is the final stage of the butterfly known as an adult butterfly. Once all the transformation is done inside the pupa. A person has to be very lucky to see an adult butterfly emerging out. The adult stage is the final stage of the butterfly life cycle. In this stage, the larva gets more extensive and has a pair of giant wings for the fly. But after this stage the butterfly can't grow. The main job of the butterfly is to mate and lay eggs. At this stage, some butterflies can eat nectar from flowers, but some cannot. Most of the adults' butterfly live for one or two weeks. Some of them can hibernate in winter and live more days. When the butterfly first emerges from the pupa, both of the wings are soft and folded against its body. So, all the body parts fit into the pupa.



Taxonomy of Insects:

Butterflies belong to class Insecta which is a part of Phylum Arthropoda. Other classes of Phylum Arthropoda are Crustacea, Myriapoda, Arachnida, and Onychophora. These classes differ from each other in various characteristics ranging from body regions, locomotor organ types, respiration type, feeding habit, sensory organ types etc.

Host and Nectar Plants Host plant:

Host plants are plants that adult butterflies depend upon to raise their larval young. Female butterflies lay their eggs directly onto their host plant of choice since caterpillars cannot travel far to feed. This includes trees, shrubs, herbs, climbers, and grasses. Trees like *Bauhinia racemosa*, *Albizia lebeckii*, *Aegle marmelos*, *Butea monosperma*, and *Peltophorumpterocarpum*; and shrubs like *Caesalpinia pulcherrima*, *Calotropis gigantea*, and *Calotropis procera*, were found frequently during the survey. The important herbs like *Barleria cristata*, *Mimosa pudica*, *Hygrophila auriculata*, and *Senna tora* act as host and nectar plants for butterflies. Nectar Plants: A constant supply of nectar is vital to reduce the waning of native butterfly populations, and so it's important to try and deliver a range of plants that will have at least some viable nectar-producing flowers throughout the year. Wild plants like *Ocimum americanum*, *Boerhavia diffusa*, *Desmodium triflorum*, *Euphorbia hirta*, *Malvastrum coromandelianum*, *Melochia corchorifolia*, *Ludwigia adscendens*, *Sesamum indicum*, *Sesamum radiatum*, *Sida cordifolia*, *Tridax procumbens*, *Triumfetta rhomboidea*, and *Urena lobata*, are important sources of nectar.

Classification of Butterflies:

Butterflies are classified into two superfamilies, Hesperioidea, consisting of the 'skippers,' and Papilionoidea, or 'true butterflies.' Skippers differ in several important ways from the remaining butterflies. Skippers have the antennae clubs hooked backward, have stocky bodies, and possess stronger wing muscles and better eyes. However, Hesperioidea and Papilionoidea are considered sister taxa. Modern taxonomists place them all in the superfamily Papilionoidea, distinguishing the skippers from the other butterflies at the series level only. There are about 180,000 described species of Lepidoptera, around 10% of all described species of living organisms. In butterflies (Papilionidae), there are about 17,500 described species, or 1% of known organisms. In India, there are about 1646 species of butterflies recorded.



Importance of Butterflies :

Humans regard a variety of insects to be pests. Insects, on the other hand, are extremely important for a variety of reasons. Ecological Importance Insects play a significant role in many ecosystems, performing a variety of services. They help to aerate the soil, pollinate blossoms, and keep insects and plant pests at bay. Scavenger insects, particularly beetles, feast on dead animals and fallen trees, recycling nutrients back into the earth. Insects, as decomposers, aid in the formation of top soil, the nutrient-rich layer of soil that aids plant growth. Burrowing insects such as ants and beetles excavate tunnels that offer water conduits for plants. Flowering plants are pollinated by bees, wasps, butterflies, and ants. Certain insect populations, such as aphids and caterpillars, which feed on new plant growth, are controlled by bugs and praying mantis. Finally, all insects use the nutrients in their droppings to fertilize the earth. Economic Importance Insects are extremely valuable economically. Honey, wax, lacquer, and silk are examples of beneficial things produced by insects. Humans have reared honeybees for the purpose of making honey. To make silk, the silkworm is utilized to develop silk. Insect larvae and adult insects, such as crickets, are often used as fishing bait. Insects as food Insects, of course, are not just eaten by people. Insects are the sole food source for many amphibians, reptiles, birds, and mammals, making their roles in food chains and food webs extremely important. It is possible that food webs could collapse if insect populations decline. Ecosystem value Butterflies and moths are indicators of a healthy environment and healthy ecosystems. They indicate a wide range of other invertebrates, which comprise over two-thirds of all species. Areas rich in butterflies and moths are rich in other invertebrates. These collectively provide a wide range of environmental benefits, including pollination and natural pest control. Moths and butterflies are an important element of the food chain and are prey for birds, bats and other insectivorous animals (for example, in Britain and Ireland, Blue Tits eat an estimated 50 billion moth caterpillars each 13 year). Butterflies and moths support a range of other predators and parasites, many of which are specific to individual species, or groups of species. Butterflies have been widely used by ecologists as model organisms to study the impact of habitat loss and fragmentation, and climate change. Educational value Butterflies and moths have fascinating life-cycles that are used in many countries to teach children about the natural world. The transformation from egg to caterpillar to chrysalis is one of the wonders of nature. Other educational aspects include the intricate wing patterns and iridescence, and as examples of insect migration. Aesthetic value Butterflies and moths are part of our natural heritage and have been studied



for over 300 years. Butterflies and moths are beautiful. Many are iconic and popular. People like butterflies. There are many references to butterflies and moths in literature, from the Bible through Shakespeare to modern day literature, and from poetry to musical lyrics. Butterflies are used by advertisers and illustrators the world over as way of indicating that something is environmentally friendly. Butterflies are often portrayed as the essence of nature or as representing freedom, beauty or peace.

Some common butterfly species of Mejia:

Despite being a much polluted area a large number of butterfly species is observed in Mejia region .We have spotted as many as 31 variety of butterflies in Mejia. Brief description of some of the species are given below:



Appias paulina, the common albatross, Christmas Island white or Ceylon lesser albatross, is a butterfly of the family Pieridae. It is found from India to Samoa.

The wingspan is about 50 mm.



Hypolimnas bolina, the great eggfly, common eggfly, varied eggfly, or in New Zealand the blue moon butterfly, is a species of nymphalid butterfly found from Madagascar to Asia and Australia.

Male

Males are monomorphic. The dorsal wing surface is jet black but features three prominent spots, two on the forewing and one on the hindwing. To a human observer these appear as white spots fringed with blue-violet. They actually consist of a white center overlain by bright ultraviolet iridescence, a colour generated by nanostructures on the wing scale surface. Numerous smaller white spots fringe the fore- and hindwings. The ventral surface lacks any ultraviolet iridescence and consists essentially of banded white markings set against a brownish background.

Female

Females are hugely variable due to the presence of both genetic polymorphism and phenotypic plasticity. Polymorphism is expressed primarily on the dorsal surface, with morphs varying in the presence of white, orange, and blue markings. One genetic morph, named *euploeoides* is thought to present a mimic of one or several members of the genus *Euploea*. The female ventral wing surfaces are similar to those of the male. Phenotypic plasticity is such that individuals are generally darker if they develop under cooler temperatures.



Common Five-ring ,Upperside



Common Five-ring ,Underside .

Ypthima baldus, the common five-ring, is a species of Satyrinae butterfly found in Asia. It belongs to the Nymphalidae family.

Ypthima baldus is found in northern India, Nepal, Bhutan, Myanmar, Laos, Thailand, Korea, China, Taiwan, Japan, Malaysia, Sumatra and Kalimantan.



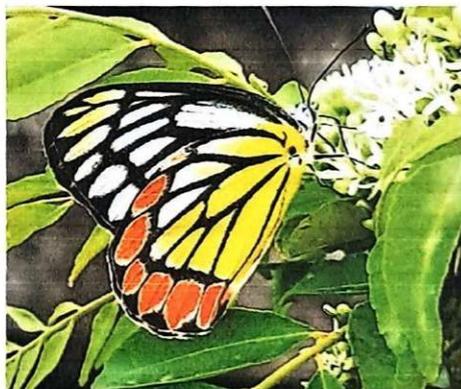
Ypthima baldus can be found on the edge of a grassy forest at an altitude of about 300 – 1200 m. Moreover it can be found in the garden area.

Male *Ypthima baldus* has a dull brown upperwings with a broad gray-black stripe on the forewing, while the female is paler distally. The upperwings of this species have a large yellow-ringed ocellus in the space 2 forewing, 2 adjoining smaller yellow ringed ocelluses in the 2 and 3 hindwings. The underside of the wings is pale grayish to brown against a whitish background, there are many fine dark brown lines. The forewings have a large, bi-pupilled, yellow-ringed subapical ocellus. The hind wing has 5 yellow ringed ocelluses in spaces 1b, 2, 3, 5 and 6. A pair of ocellus in space 2 and 3 are large and side by side, a pair of ocellus in space 5 and 6 are side by side, the size of an ocellus in space 6 is larger, one ocellus in space 1b consists of two points joined together.

Larva: *Ypthima baldus* larvae are cylindrical, whitish in color with dorsal and lateral pink spots. The head is brownish in color with a pair of short, round horns, the body is covered with long setae on the dorso-lateral and lateral parts. Adult larvae can be green or brown.

Pupa: *Ypthima baldus* pupa is creamy brown with many small brown or black patches. The length of the pupa is about 10.5 – 11 mm.

Wingspan from 35 – 40 mm.





Delias eucharis, the common Jezebel, is a medium-sized pierid butterfly found in many areas of south and southeast Asia, especially in the non-arid regions of India, Bangladesh, Sri Lanka, Indonesia, Myanmar and Thailand. It belongs to the Pieridae family. The common Jezebel is one of the most common of the approximately 225 described species in the genus *Delias*.

Male

Upperside is white. The forewings have the veins broadly black, this colour broadened triangularly at the termination of the veins, costal margin narrowly black; a broad black postdiscal transverse band from costa to dorsum sloped obliquely outwards from costa to vein 4, thence parallel to termen. Hindwing with the veins similar but for three-fourths of their length much more narrowly black; a postdiscal transverse black band as on the forewing but much narrower, curved and extended only between veins 2 and 6; beyond this the veins are more broadly black and this colour as on the forewing broadens out triangularly at the termination of the veins; the interspaces beyond the postdiscal black band pink, due to the vermilion colouration of the underside showing through.

On the underside, the forewings are similar but the black edging to the veins much broader, the upper two interspaces beyond the postdiscal transverse band tinged with yellow. Hindwing: ground colour bright yellow, the veins and transverse postdiscal band as on the upperside but much more broadly black, the latter extended from the costa to vein 2; the interspaces between the veins beyond the postdiscal fascia with a series of broadly lanceolate (lance-shaped) or cone-shaped vermilion-red spots, each spot very narrowly edged with white; the basal portion of interspace 6 white, in contrast to the bright yellow of the ground colour. Antenna black; head, thorax and abdomen white, the apical joint of the palpi black; the head and thorax with a mixture of black hairs that give these parts a grey-blue appearance.



Female

Upper and undersides similar to those in the male, but the black edging to the veins and the postdiscal transverse bands on both forewings and hindwings are much broader.

Range and Habitats

The common Jezebel are nomadic in behaviour and are found in a variety of environment including, but not limited to, temperate hill forests, tropical rainforests, dry open woodlands, and beach hinterlands. They are generally found all over India, except in the desert tracts, and up to an altitude of 7,000 feet (2,100 m) in the hills. The butterfly may be found wherever there are trees, even in towns and cities, flying high among the trees and visiting flowers.

It is also commonly seen in gardens. The females can be seen flying amongst the trees in search of its food plants, while the males are more frequently observed visiting flowers for nectar. It rests with its wings closed exhibiting the brilliantly coloured underside.

The Jezebel often flies high up in the canopy and usually comes lower down only to feed on nectar in flowers. Due to this habit apparently, it has evolved a dull upperside and a brilliant underside so that birds below it recognize it immediately while in flight and at rest.

Protection

It has bright colouration to indicate the fact that it is unpalatable due to toxins accumulated by the larvae from the host plants.

Like other unpalatable butterflies the common Jezebel is mimicked by *Prioneris sita*, the painted sawtooth. The common Jezebel can be distinguished by the shape of the orange red spots on the hindwing. In the painted saw tooth these spots are very squarish whereas in the common Jezebel they are more arrow head shaped. The painted saw tooth also flies faster and will also mudpuddle.



Castalius rosimon, the common Pierrot, is a small butterfly found in India that belongs to the lycaenids, or blues family.

The species is found in Sri Lanka, Bangladesh, India, Myanmar; Tenasserim, extending into the Malayan subregion. In the Indonesian archipelago the butterfly occurs in north-eastern Sumatra, Kalimantan, eastern Java, Bali, Bangka, Timor, Wetar, Kissar, Sumbawa and Sulawesi.

In India the butterfly is found south of the outer ranges of the Himalayas, except in desert tracts; east India; the north-west Himalayas; Assam. The butterfly is also found in the Andaman Islands and the southern Nicobar Islands.

Male

The upperside of its wings is mainly white. Forewing has the costa, apex and termen edged with black, the edging much broader on apex and termen; base outwards for a short distance more or less densely overlaid with metallic blue scales which cover and make indistinct a large basal outwardly clavate (club-shaped) black spot; a transverse black oval spot on the discocellulars touching the black edging on the costa; an oblique irregular line of four quadrate black spots beyond, the upper spot coalesced with the black on the costal border, the next spot below shifted outwards out of line, touching, as does also the lowest spot, the terminal black edging; posterior to this is a quadrate black spot in the apical half of interspace 2, and placed obliquely outwards from 1b coalescent with the terminal black border, another



similar spot in interspace 1. Individuals of this species have been reported to exhibit seasonal colour variations and melanic aberrations that shows a similar pigmentation pattern.

Hindwing: three basal black somewhat coalescent spots overlaid with metallic blue scaling; the costal margin above the subcostal vein and vein 7 black; this colour filling also the base of interspace 6, where in some specimens it is divided into a basal portion with a spot beyond; a postdiscal curved transverse black band followed by a subterminal transverse series of black spots, each spot edged inwardly and outwardly by very slender lunules of the white ground colour; on the inner side of the postdiscal band posteriorly is a broken line of four black generally coalescent spots two and two, the two upper often touching the postdiscal band.

Underside primarily white. Forewing has a long oblique black band from base outwards to the costa; below it and obliquely placed an irregular black somewhat conical mark; following these are two outwardly oblique, medially interrupted, black macular bands; the inner of the two extended from costa along the discocellulars, is then widely interrupted below its posterior portion that is formed of two elongate coalescent spots and touches the inner subterminal transverse line of elongate spots just above the tornus; the outer, obliquely placed line is subapical and medially broken, the middle portion consisting of a quadrate spot is shifted outwards; finally, two parallel subterminal transverse series of black elongate spots, the inner series of broad, more or less rectangular spots, the outer series of more linear spots, the latter coalescent anteriorly with a slender anteciliary black line.

Hindwing: a transverse basal black band, with an elongate black spot below it on the dorsum; a transverse subbasal line of four well-separated black spots; a transverse, oval, discocellular black spot and obliquely above it three subcostal similar spots, the inner two coalescent; postdiscal and terminal markings consist, the former of four black posterior spots two and two, each pair coalescent and placed *en echelon*, the latter of a transverse double series of subterminal black spots and an anteciliary black line; the upper portion of the postdiscal markings touches the inner subterminal line. Cilia of both forewings and hindwings white alternated with black at the apices of the veins; filamentous short tail to the hindwing black tipped with white.

Antennae, head, thorax and abdomen black, the shafts of the antennae ringed with white, the head between the eyes and behind them white; beneath: the palpi, thorax and abdomen white, the last barred broadly with white on the sides.



Female

Similar to the male but with the black markings on the upper and undersides broader.



Danaus chrysippus, also known as the plain tiger, African queen, or African monarch, is a medium-sized butterfly widespread in Asia, Australia and Africa. It belongs to the Danainae subfamily of the brush-footed butterfly family Nymphalidae. Danainae primarily consume plants in the genus *Asclepias*, more commonly called milkweed. Milkweed contains toxic compounds, cardenolides, which are often consumed and stored by many butterflies. Because of their emetic properties, the plain tiger is unpalatable to most predators. As a result, its colouration is widely mimicked by other species of butterflies. The plain tiger inhabits a wide variety of habitats, although it is less likely to thrive in jungle-like conditions and is most often found in drier, wide-open areas.

D. chrysippus is a medium-sized butterfly with a wingspan of about 7–8 cm (2.8–3.1 in). The body is black with white spots. The wings are a brownish orange, the upper side brighter and richer than the underside. The apical half of the forewing is black with a white band. The hindwing has three black spots in the centre. The wings are bordered in black and outlined with semicircular white spots. This species exhibits slight sexual dimorphism, as the male has large scent glands on his hindwings, which the female lacks. They appear as a large black spot with a white centre if viewed from the underside.

D. chrysippus is a polymorphic species, so the exact colouring and patterning vary within and between populations.



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Acknowledgment:

I would like to thank my teachers Debraj sir and Arijit sir for their guidance and motivation. I am also thankful to the other teachers of the college, my parents and friends. After completing this project, I have acquired knowledge on various species of butterflies in Bankura district, West Bengal.

Pritikana Das

Students' Signature

Debraj Das 5/11/22

Teacher's signature

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Mejia, Bankura



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DEGREE COLLEGE

ENVIRONMENTAL STUDIES PROJECT REPORT

PROJECT TITLE: Study of a common insect: Cockroach
SUBJECT: ENVIRONMENTAL STUDIES (ACSHP/ 104/ AECC-1)
NAME: RAJIB MAJI
PROGRAMME NAME: Bengali (Prog)
CLASS: 1ST SEM
ROLL NO.: 2210123
YEAR: 2022-23

Schraf Das 5/11/22
EXAMINED
Kabi Jagadram Roy Govt. General
Degree College
Mejia, Bankura



Study of a common insect: The Cockroach

History of the species

The cockroaches are an ancient group, with their ancestors, known as "roachoids", originating during the Carboniferous period, some 320 million years ago. Those early ancestors, however, lacked the internal ovipositors of modern roaches. About 30 cockroach species out of 4,600 are associated with human habitats. Some species are well-known pests. Cockroaches are somewhat generalized insects lacking special adaptations (such as the sucking mouthparts of aphids and other true bugs); they have chewing mouthparts and are probably among the most primitive of living Neopteran insects. They are common and hardy insects capable of tolerating a wide range of climates, from Arctic cold to tropical heat. Tropical cockroaches are often much larger than temperate species.

Modern cockroaches are not considered to be a monophyletic group, as it has been found based on genetics that termites are deeply nested within the group, with some groups of cockroaches more closely related to termites than they are to other cockroaches, thus rendering Blattaria paraphyletic. Both cockroaches and termites are included into Blattodea.

Some species, such as the gregarious German cockroach, have an elaborate social structure involving common shelter, social dependence, information transfer and kin recognition. Cockroaches have appeared in human culture since classical antiquity. They are popularly depicted as large, dirty pests, although the majority of species are small and inoffensive and live in a wide range of habitats around the world.

Evolution

Cockroaches are members of the superorder Dictyoptera, which includes the termites and mantids, a group of insects once thought to be separate from cockroaches. Currently, 4,600 species and over 460 genera are described worldwide. The name "cockroach" comes from the Spanish word for cockroach, *cucaracha*, transformed by 1620s English folk etymology into "cock" and "roach". The scientific name derives from the Latin *blatta*, "an insect that shuns the light", which in classical Latin was applied not only to cockroaches, but also to mantids.



Figure 1 German Cockroach
(*Blattella germanica*)



Figure 2 American Cockroach
(*Periplaneta americana*)



Figure 4: Brown Banded Cockroach
(*Supella longipalpa*)



Figure 3: Oriental cockroach (*Blatta orientalis*)

Historically, the name Blattaria was used largely interchangeably with the name Blattodea, but whilst Blattaria was used to refer to 'true' cockroaches exclusively, the Blattodea also includes the termites. The current catalogue of world cockroach species uses the name Blattodea for the group. Another name, Blattoptera, is also sometimes used to refer to extinct cockroach relatives.

The earliest cockroach-like fossils ("blattopterans" or "roachoids") are from the Carboniferous period 320 million years ago. Fossil roachoids are considered the common ancestor of both mantises and modern cockroaches, and are distinguished from the latter by the presence of a long external ovipositor. As the body, hind wings and mouthparts are not preserved in fossils frequently, the relationship of these roachoids and modern cockroaches remains disputed. The first fossils of modern cockroaches with internal ovipositors appeared in the early Cretaceous. Recent phylogenetic analysis suggests that cockroaches arose by the Jurassic.



The evolutionary relationships of the Blattodea (cockroaches and termites) shown in the cladogram are based on Inward, Beccaloni and Eggleton (2007). The cockroach families Anaplectidae, Lamproblattidae, and Tryonicidae are not shown but are placed within the superfamily Blattoidea. The cockroach families Corydiidae and Ectobiidae were previously known as the Polyphagidae and Blattellidae.

Anatomy

Most species of cockroach are about the size of a thumbnail, but several species are notably larger. The world's heaviest cockroach is the Australian giant burrowing cockroach *Macropanesthia rhinoceros*, which can reach 8 centimetres (3 in) in length and weigh up to 35 grams (1.2 oz). Comparable in size is the Central American giant cockroach *Blaberus giganteus*. The longest cockroach species is *Megaloblatta longipennis*, which can reach 97 mm (3+7/8 in) in length and 45 mm (1+1/4 in) across.^[24] A Central and South American species, *Megaloblatta blaberoides*, has the largest wingspan of up to 185 mm (7+1/4 in). At the other end of the size scale, *Attaphila* cockroaches that live with leaf-cutter ants include some of the world's smallest species, growing to about 3.5 mm in length.

Cockroaches are generalized insects with few special adaptations, and may be among the most primitive living Neopteran insects. They have a relatively small head and a broad, flattened body, and most species are reddish-brown to dark brown. They have large compound eyes, two ocelli, and long, flexible antennae. The mouthparts are on the underside of the head and include generalized chewing mandibles, salivary glands and various touch and taste receptors.

The body is divided into a thorax of three segments and a ten-segmented abdomen. The external surface has a tough exoskeleton which contains calcium carbonate; this protects the inner organs and provides attachment to muscles. This external exoskeleton is coated with wax to repel water. The wings are attached to the second and third thoracic segments. The tegmina, or first pair of wings, are tough and protective; these lay as a shield on top of the membranous hind wings, which are used in flight. All four wings have branching longitudinal veins, as well as multiple cross-veins.

The three pairs of legs are sturdy, with large coxae and five claws each. They are attached to each of the three thoracic segments. Of these, the front legs are the shortest and the hind legs



the longest, providing the main propulsive power when the insect runs. The spines on the legs were earlier considered to be sensory, but observations of the insect's gait on sand and wire meshes have demonstrated that they help in locomotion on difficult terrain. The structures have been used as inspiration for robotic legs.

The abdomen has ten segments, each having a pair of spiracles for respiration. In addition to the spiracles, the final segment consists of a pair of cerci, a pair of anal styles, the anus and the external genitalia. Males have an aedeagus through which they secrete sperm during copulation, while females have spermatheca for storing sperm and an ovipositor through which the oothecae are laid.

Habitat

Cockroaches are abundant throughout the world and live in a wide range of environments, especially in the tropics and subtropics. Cockroaches can withstand extremely low temperatures, allowing them to live in the Arctic. Some species are capable of surviving temperatures of -122°C (-188°F) by manufacturing an antifreeze made out of glycerol. In North America, 50 species separated into five families are found throughout the continent. 450 species are found in Australia. Only about four widespread species are commonly regarded as pests.

Cockroaches occupy a wide range of habitats. Many live in leaf litter, among the stems of matted vegetation, in rotting wood, in holes in stumps, in cavities under bark, under log piles and among debris. Some live in arid regions and have developed mechanisms to survive without access to water sources. Others are aquatic, living near the surface of water bodies, including bromeliad phytotelmata, and diving to forage for food. Most of these respire by piercing the water surface with the tip of the abdomen which acts as a snorkel, but some carry a bubble of air under their thoracic shield when they submerge. Others live in the forest canopy where they may be one of the main types of invertebrate present. Here they may hide during the day in crevices, among dead leaves, in bird and insect nests or among epiphytes, emerging at night to feed.

Social behavior

When reared in isolation, German cockroaches show behavior that is different from behavior when reared in a group. In one study, isolated cockroaches were less likely to leave their shelters and explore, spent less time eating, interacted less with conspecifics when exposed to



them, and, among males, took longer to recognize receptive females. Because these changes occurred in many contexts, the authors suggested them as constituting a behavioral syndrome. These effects might have been due either to reduced metabolic and developmental rates in isolated individuals or the fact that the isolated individuals had not had a training period to learn about what others were like via their antennae.

Individual American cockroaches appear to have consistently different "personalities" regarding how they seek shelter. In addition, group personality is not simply the sum of individual choices, but reflects conformity and collective decision-making.

Sounds

Some species make a buzzing noise while other cockroaches make a chirping noise. *Gromphadorhina* species and *Archiblatella hoeveni* produce sound through the modified spiracles on the fourth abdominal segment. In the former species, several different hisses are produced, including disturbance sounds, produced by adults and larger nymphs; and aggressive, courtship and copulatory sounds produced by adult males. *Henschoutedenia epilamproides* has a stridulatory organ between its thorax and abdomen, but the purpose of the sound produced is unclear.

Several Australian species practice acoustic and vibration behaviour as an aspect of courtship. They have been observed producing hisses and whistles from air forced through the spiracles. Furthermore, in the presence of a potential mate, some cockroaches tap the substrate in a rhythmic, repetitive manner. Acoustic signals may be of greater prevalence amongst perching species, particularly those that live on low vegetation in Australia's tropics.

Digestive tract

Cockroaches are generally omnivorous; the American cockroach (*Periplaneta americana*), for example, feeds on a great variety of foodstuffs including bread, fruit, leather, starch in book bindings, paper, glue, skin flakes, hair, dead insects and soiled clothing. Many species of cockroach harbor in their gut symbiotic protozoans and bacteria which are able to digest cellulose. In many species, these symbionts may be essential if the insect is to utilize cellulose; however, some species secrete cellulase in their saliva, and the wood-eating cockroach, *Panesthia cribrata*, is able to survive indefinitely on a diet of crystallized cellulose while being free of microorganisms.



Tracheae and Breathing

Like other insects, cockroaches breathe through a system of tubes called *tracheae* which are attached to openings called *spiracles* on all body segments. When the carbon dioxide level in the insect rises high enough, valves on the spiracles open and carbon dioxide diffuses out and oxygen diffuses in. The tracheal system branches repeatedly, the finest *tracheoles* bringing air directly to each cell, allowing gaseous exchange to take place.

While cockroaches do not have lungs as do vertebrates, and can continue to respire if their heads are removed, in some very large species, the body musculature may contract rhythmically to forcibly move air in and out of the spiracles; this may be considered a form of breathing.

Reproduction

Cockroaches use pheromones to attract mates, and the males practice courtship rituals, such as posturing and stridulation. Like many insects, cockroaches mate facing away from each other with their genitalia in contact, and copulation can be prolonged. A few species are known to be parthenogenetic, reproducing without the need for males.

Female cockroaches are sometimes seen carrying egg cases on the end of their abdomens; the German cockroach holds about 30 to 40 long, thin eggs in a case called an *ootheca*. She drops the capsule prior to hatching, though live births do occur in rare instances. The egg capsule may take more than five hours to lay and is initially bright white in color. The eggs are hatched from the combined pressure of the hatchlings gulping air. The hatchlings are initially bright white nymphs and continue inflating themselves with air, becoming harder and darker within about four hours. Their transient white stage while hatching and later while molting has led to claims of albino cockroaches. Development from eggs to adults takes three to four months. Cockroaches live up to a year, and the female may produce up to eight egg cases in a lifetime; in favorable conditions, she can produce 300 to 400 offspring. Other species of cockroaches, however, can produce far more eggs; in some cases a female needs to be impregnated only once to be able to lay eggs for the rest of her life.

The female usually attaches the egg case to a substrate, inserts it into a suitably protective crevice, or carries it about until just before the eggs hatch. Some species, however, are ovoviviparous, keeping the eggs inside their body, with or without an egg case, until they hatch. At least one genus, *Diploptera*, is fully viviparous.



In research and education

Because of their ease of rearing and resilience, cockroaches have been used as insect models in the laboratory, particularly in the fields of neurobiology, reproductive physiology and social behavior. The cockroach is a convenient insect to study as it is large and simple to raise in a laboratory environment. This makes it suitable both for research and for school and undergraduate biology studies. It can be used in experiments on topics such as learning, sexual pheromones, spatial orientation, aggression, activity rhythms and the biological clock, and behavioral ecology. Research conducted in 2014 suggests that humans fear cockroaches the most, even more than mosquitoes, due to an evolutionary aversion.

As pests

The Blattodea include some thirty species of cockroaches associated with humans; these species are atypical of the thousands of species in the order. They feed on human and pet food and can leave an offensive odor. They can passively transport pathogenic microbes on their body surfaces, particularly in environments such as hospitals. Cockroaches are linked with allergic reactions in humans. One of the proteins that trigger allergic reactions is tropomyosin, which can cause cross-reactive allergy to dust mites and shrimp. These allergens are also linked with asthma. Some species of cockroach can live for up to a month without food, so just because no cockroaches are visible in a home does not mean that they are not there. Approximately 20–48% of homes with no visible sign of cockroaches have detectable cockroach allergens in dust.

As food

Although considered disgusting in Western culture, cockroaches are eaten in many places around the world. Whereas household pest cockroaches may carry bacteria and viruses, cockroaches bred under laboratory conditions can be used to prepare nutritious food. In Thailand and Mexico, the heads and legs are removed, and the remainder may be boiled, sautéed, grilled, dried or diced. Frying makes the insect crispy with soft innards that taste like cottage cheese. Recipes from Taiwan also call for its use in omelets. It can be a feeder insect for pet reptiles.



Medicinal use

Cockroaches are raised in large quantities in China for the production of traditional medicine and cosmetics. There are about 100 cockroach farms in the country. Running a farm involves relatively low starting and operating costs due to how hardy and easy to process the insects are. Chinese and South Korean researchers are investigating cockroaches for treating baldness, AIDS, cancer, and as a dietary supplement.

Conservation

While a small minority of cockroaches are associated with human habitats and viewed as repugnant by many people, a few species are of conservation concern. The Lord Howe Island wood-feeding cockroach (*Panesthia lata*) is listed as endangered by the New South Wales Scientific Committee, but the cockroach may be extinct on Lord Howe Island itself. The introduction of rats, the spread of Rhodes grass (*Chloris gayana*) and fires are possible reasons for their scarcity. Two species are currently listed as endangered and critically endangered by the IUCN Red List, *Delosia ornata* and *Nocticola gerlachi*. Both cockroaches have a restricted distribution and are threatened by habitat loss and rising sea levels. Only 600 *Delosia ornata* adults and 300 nymphs are known to exist, and these are threatened by a hotel development. No action has been taken to save the two cockroach species, but protecting their natural habitats may prevent their extinction. In the former Soviet Union, cockroach populations have been declining at an alarming rate; this may be exaggerated, or the phenomenon may be temporary or cyclic. One species of roach, *Simandoa conserfariam*, is considered extinct in the wild.

Cultural Depictions

Cockroaches were known and considered repellent but medicinally useful in Classical times. An insect named in Greek "σίλφη" (*silphe*) has been identified with the cockroach, though the scientific name *Silpha* refers to a genus of carrion beetles. It is mentioned by Aristotle, saying that it sheds its skin; it is described as foul-smelling in Aristophanes' play *Peace*; Euenus called it a pest of book collections, being "page-eating, destructive, black-bodied" in his *Analect*. Virgil named the cockroach "Lucifuga" ("one that avoids light"). Pliny the Elder recorded the use of "Blatta" in various medicines; he describes the insect as disgusting, and as seeking out dark corners to avoid the light. Dioscorides recorded the use of the "Silphe", ground up with oil, as a remedy for earache.



Lafcadio Hearn (1850–1904) asserted that "For tetanus cockroach tea is given. I do not know how many cockroaches go to make up the cup; but I find that faith in this remedy is strong among many of the American population of New Orleans. A poultice of boiled cockroaches is placed over the wound." He adds that cockroaches are eaten, fried with garlic, for indigestion.

Several cockroach species, such as *Blattica dubia*, are raised as food for insectivorous pets. A few cockroach species are raised as pets, most commonly the giant Madagascar hissing cockroach, *Gromphadorhina portentosa*. Whilst the hissing cockroaches may be the most commonly kept species, there are many species that are kept by cockroach enthusiasts: there is even a specialist society: the Blattodea Culture Group (BCG), which was a thriving organisation for about 15 years although now appears to be dormant. The BCG provided a source of literature for people interested in rearing cockroaches, which was otherwise limited to either scientific papers, general insect books, or books covering a variety of exotic pets; in the absence of an inclusive book, one member published *Introduction to Rearing Cockroaches*, which still appears to be the only book dedicated to rearing cockroaches.

Cockroaches have been used for space tests. A cockroach given the name Nadezhda was sent into space by Russian scientists as part of a Foton-M mission, during which she mated, and later became the first terrestrial animal to produce offspring that had been conceived in space.

Because of their long association with humans, cockroaches are frequently referred to in popular culture. In Western culture, cockroaches are often depicted as dirty pests. In a 1750–1752 journal, Pehr Osbeck noted that cockroaches were frequently seen and found their way to the bakeries, after the sailing ship *Gothenburg* ran aground and was destroyed by rocks.

Donald Harington's satirical novel *The Cockroaches of Stay More* (Harcourt, 1989) imagines a community of "roosterroaches" in a mythical Ozark town where the insects are named after their human counterparts. Madonna has famously quoted, "I am a survivor. I am like a cockroach, you just can't get rid of me." An urban legend maintains that cockroaches are radiation-resistant, and thus would survive a nuclear war.

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ENVIRONMENTAL POLLUTION

Developmental Activities such as Construction, Transportation and Manufacturing not only deplete the Natural Resources but also produce large amount of wastes that leads to Pollution of Air, Water, Soil and Oceans; Global Warming and Acid rains. Untreated or Improperly treated Waste is a Major Cause of Pollution of Rivers and Environmental degradation causing ill health and loss of crop productivity. In this lesson I will study about the Major Causes of Pollution, their effects on our environment and the various measures that can be taken to control such pollutions.

OBJECTIVES

After Completing this Lesson, I will be able to:

- Define the terms Pollution and Pollutants;
- List various kinds of Pollution;
- Describe types of Pollution, sources, harmful effects on human health and control of air pollution, noise pollution;
- Describe Water Pollution, its causes and control;
- Describe Soil Pollution, its causes and control.



POLLUTION AND POLLUTANTS

Human Activities directly or indirectly affect the Environment adversely. A stone crusher adds a lot of suspended particulate matter and noise into the atmosphere. Automobiles emit from their tail pipes Oxides of nitrogen, sulphur dioxide, Carbon dioxide, Carbon Monoxide and a complex mixture of Unburnt hydrocarbons and black soot which pollute the atmosphere. Domestic sewage and run off from agricultural fields laden with pesticides and fertilizers, pollute water bodies. Effluents from tanneries contain many harmful chemicals and emit foul smell. These are only a few examples which show how human activities pollute the environment. Pollution may be defined as addition of undesirable material into the environment as a result of human activities. The agents which cause environmental pollution are called pollutants. A pollutant may be defined as a physical, chemical or biological substance unintentionally released into the environment which is directly or indirectly harmful to humans and other living organisms.

TYPES OF POLLUTION

Pollution may be of the following types:

- Air Pollution
- Water Pollution
- Noise Pollution
- Soil Pollution



① AIR POLLUTION:

Air Pollution is a result of industrial and certain domestic activity. An ever increasing use of fossil fuels in power plants, industries, transportation, mining, construction of buildings, stone quarries had led to air pollution. Air



AIR POLLUTION

Pollution may be defined as the presence of any solid, liquid or gaseous substance including noise and radioactive radiation in the atmosphere in such concentration that may be directly and indirectly injurious to health of humans or other living organisms, plants, property or interfere with the normal environmental processes. Air pollutants are of two types ① Suspended Particulate Matter, and ② Gaseous pollutants like Carbon dioxide (CO_2), NO_x , etc. Some of the major pollutants, their sources are given below -

① PARTICULATE MATTER POLLUTANTS:

Particulate matter pollutants suspended in the air are dust and soot released from the industrial chimneys. Their size ranges from 0.001 to 500 μm in diameter. Particles less than 10 μm float and move freely with the air current. Major source of SPM (Suspended Particulate Matter) are vehicles, power plants, construction activities, oil refinery, railway yard, market place, industries, etc.



② FLY ASH :-

Fly Ash is Ejected mostly by thermal Power Plants as by products of Coal burning Operations. Fly ash Pollutants powder air and water and may cause heavy metal pollution in water bodies. Fly ash affects Vegetation as a result of its direct deposition on leaf surfaces or indirectly through its deposition on soil. Fly ash is now being used for making bricks and as a landfill material.

③ GASEOUS POLLUTANTS :-

Power Plants, industries, different types of Vehicles - both private and commercial use of petrol and diesel as fuel and release, gaseous



Air Pollution

pollutants such as Carbon dioxide, Oxides of nitrogen and Sulphur dioxide, Oxides of nitrogen and Sulphur dioxide along with particulate matter in the form of smoke.

PREVENTION AND CONTROL OF AIR POLLUTION

① Prevention and Control of Indoor Air Pollution :-

Use of Wood and dung cakes should be replaced by cleaner fuels such as biogas, kerosene or electricity. But supply of electricity is limited. Use of biogas and CNG use of and need to encourage. Segregation of waste, pretreatment at source, sterilisation of rooms will help in checking indoor air pollution.



① Scrubbers :-

Scrubbers are Wet Collectors. They remove Aerosols from a stream of gas either by collecting wet particles on a surface followed by their removal or else the particles are wetted by their removal or else the particles are wetted by a scrubbing liquid.

② Control of Vehicular Pollution :-

- The emission standards for automobiles have been set which if followed will reduce the pollution. Standards have been set for the durability of Catalytic converters which reduce vehicular emissions.
- In cities like Delhi, motor vehicles need to obtain Pollution Under Control (PUC) Certificate at regular intervals.
- The price of diesel is much cheaper than petrol which promotes use of diesel. To reduce emission of sulphur dioxide, sulphur content in diesel has been reduced to 0.06%.

NOISE POLLUTION

Noise is one of the most pervasive pollutant. A musical clock may be nice to listen during the day, but may be irritant during sleep at night. Noise by definition is "Sound without Value" or "any noise that is unwanted by the recipient". Noise level is measured in terms of decibels (dB). WHO has prescribed optimum noise level as 45 dB by day and 35 by night. Anything above 80 dB is hazardous.



Sources of some of the Common Activities noises and their Intensity.

Source	Intensity	Source	Intensity
Quiet Conversation	20-30 dB	Radio music	50-60 dB
Low Conversation	60dB	Traffic Noise	60-90 dB
Lawn Mower	60-80dB	Heavy Truck	90-100dB
Aircraft Noise	90-120dB	Space Vehicle	140-179dB
Beat music	120dB	Launch	
Motor Cycle	105 dB	Jet Engine	140 dB

Sources of Noise Pollution:

Noise Pollution is highly annoying and irritating. Noise disturbs sleep, causes hypertension (high blood pressure), emotional problems such as aggression.



Noise Pollution

All human activities contribute to noise pollution to varying extent. Sources of noise pollution are many may be located indoors or outdoors.

(A) Indoor Sources: Include noise produced by radio, television, generators, electric fans, air coolers, air conditioners, different home appliances, and family conflict. Noise like other pollutants is a by product of industrialization, urbanization and modern civilization.

(B) Outdoor Sources: of Noise Pollution include indiscriminate use of loud speakers, industrial activities, automobiles, rail traffic, aeroplanes and activities such as those at market place, religious, social and cultural.



functions sports and political rallies. During festivals, marriage and many other occasions, use of fire crackers to noise pollution.

■ Effects Of Noise Pollution :

Noise Pollution is highly annoying and irritating. Noise disturb sleep, causes hypertension (high Blood Pressure), emotional problems such as aggression, mental depression and annoyance.

■ Prevention And Control of Noise Pollution :

Following steps can be taken to control or minimize noise pollution-

- Road traffic noise can be reduced by better designing and proper maintenance of vehicles.
- Industrial noises can be reduced by sound proofing equipment like generators and areas producing lot of noise.
- A green belt of trees is an efficient noise absorber.

WATER POLLUTION

Addition or presence of undesirable substances in water is called water pollution.



Water Pollution

Water Pollution is one of the most serious environmental problems. Water pollution is caused by a variety of human activities such as industrial effluents discharged from a specific location such as a drain pipe carrying industrial effluents discharged directly into a water body. It represents point source of pollution.

■ Sources Of Water Pollution:

Water Pollution is the major source of water born disease and other health problems. Sediments brought by run off water from agricultural fields and discharge of untreated or partially treated sewage and industrial effluents, disposal of fly ash or solid waste into or close to a water body cause severe problems of water pollution.



Water Pollution

■ Ground Water Pollution:~ Lot of people around the world depend on ground water for drinking, domestic and industrial and agricultural uses. However, human activities such as improper disposal, dumping of farm yard manures and agricultural chemicals, industrial effluents are causing pollution of ground water.

■ Control of Water Pollution:

The following measures can be adopted to control water pollution-

- ① The water requirement should be minimized by altering the techniques involved.
- ② Water should be refused with or without treatment.
- ③ Recycling of water after treatment should be possible to the extent.
- ④ The quantity of waste water discharge should be minimized.



SOIL POLLUTION

Addition of substances which adversely affect the quality of soil or its fertility is known as soil pollution. Generally polluted water also pollute soil. Solid waste is a mixture of plastics, cloth, glass, metal and organic matter, sewage, sewage sludge, building debris, generated from households, commercial and industrial establishments add to soil pollution. Acid rain and dry deposition of pollutants on land surface also contribute to soil pollution.



Soil Pollution

■ Sources of Soil Pollution: Plastic bags - Plastic bags made from low density polyethylene (LDPE), is virtually indestructible, create colossal environmental hazard. Plastic is biodegradable and burning of plastic bags in garbage dumps release highly toxic and poisonous gases like Carbon Monoxide, Carbon dioxide, Phosgene, dioxine and other poisonous chlorinated compounds.

⑥ Industrial Sources - It includes fly ash, chemical residues metallic and nuclear wastes. Large number of waste of industrial chemicals, dyes, acids, etc. find their way into the soil are known to create many health hazards including cancer.



Control of Soil Pollution:

Indiscriminate disposal of solid waste should be avoided. The Control soil pollution, it is essential to stop the use of plastic bags and instead use bags of degradable materials like paper and cloth. The industrial wastes prior to disposal should be properly treated for removing hazardous materials. Biomedical waste should be separately collected and incinerated in proper incinerators.

WHAT I HAVE LEARNT

- Nature's components such as air, water, soil, forest and fisheries are resources exploited by humans and their pollution are by product of urbanization and industrialization.
- Pollution in effect is an undesirable by product of industrialization and urbanization.
- There are four types of pollution; air pollution, water pollution, noise pollution, soil pollution.
- Air pollution is a result of industrial and certain domestic activity.
- Use of cleaner fuels such as biogas, CNG and electricity prevent air pollution.
- Segregation of waste, pretreatment at source, sterilization of rooms will help in checking indoor pollution.



ACKNOWLEDGEMENT

I am thankful to all respected Professors for advice and Computation with their guidance and supervision. I have been able to complete this project. The project taught me about the very kinds of pollution and their effects in the world. I am thankful to my professor Dr. Debraj Das for giving me this topic, I have been able to learn a lot above it.

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SUBJECT: ENVIRONMENTAL STUDIES (ACSHP/ 104/ AECC-1)
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ACKNOWLEDGEMENT

I am thankful to all respected professors for advice and computation with their guidance and supervision. I have been able to complete this project. The project has taught me a lot about the common birds of West Bengal and way to preserve them. I am thankful to our Professor Dr. Debnaj Das for giving me this topic from which I have been able to learn a lot about birds.

I would also like to thank our Principal Shri. Alok Kumar Das for encouraging us and also my fellow friends and my parents for helping me out in problems.



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Introduction :-

Birds are feathered, winged, two legged, warm-blooded, eggs laying vertebrates, modern birds are characterized by feathers, a beak, laying eggs having hard shells, a high metabolic rate, four chambered heart and a light weight with strong skeleton.

Birds also have a digestive and respiratory system that are uniquely adapted for flight. Some birds like parrots are among the most intelligent bird species that can transmit knowledge among generations. Many species annually migrate great distances and others perform shorter irregular movements. Birds are sometimes very social and communicate with visual signals, calls or by singing songs.

Birds walk, run, hop, swim, perch, cling, fly and even dig. They live in woodlands, open areas, cities farms, lakes, swamps and even on the top of the ocean. They lay eggs and raise their young in holes in the ground, in nests of varying complexity in vegetation or on the ground, in holes in trees, in human-constructed nest boxes or on various parts of the building,





Domestic Pigeon :-

The domestic Pigeon is a pigeon subspecies that was derived from the rock dove or rock pigeon. The rock pigeon is the world's oldest domesticated bird. Mesopotamian cuneiform tablets mention the domestication of pigeons more than 5000 years ago, as do the Egyptian hieroglyphics. Research suggests that domestication of pigeons occurred as early as 10,000 years ago.

Scientific Name :- Columba livia domestica

Diet :- Wild pigeons eat a variety of grains, seeds, greens, berries, fruits and will occasionally eat insects, snails and earth-worms.

Distribution :- They are largely distributed in the Europe, Asia and northern Africa regions.

Habitat :- Pigeons are found everywhere except for the driest places like Antarctica and the high Arctic. They can nest in any place like rock cliffs, buildings, open scrubs, etc.

Lifespan :- Adults may live up to 15 years with birds in captivity often reaching over 30 years, although a more realistic lifespan in feral populations is around four years.





Common Myna :-

The common Myna of Indian Myna sometimes spelled mynah, is a bird in the family Sturnidae, native to Asia. An omnivorous open woodland bird with a strong territorial instinct, the common myna has adapted extremely well to urban environments.

Scientific Name :- Acridotheres tristis.

Diet :- They are accomplished scavengers, feeding on almost anything, including insects, fruits and vegetables, scraps, pet foods and even fledging sparrows.

Distribution :- The Common Myna is native to Asia, with its initial home range spanning Iran, Pakistan, India, Nepal, Sri Lanka, Bhutan, Bangladesh, Afghanistan, Uzbekistan, Tajikistan, Turkmenistan, Myanmar, Malaysia, Singapore, peninsular Thailand, Indochina, Japan and China.

Habitat :- They are typically found in woodland, cultivation and around habitation.

Lifespan :- An Indian mynah bird on an average lives up to 4 years in the wild though at times they reach the age of 12 years too.





House Crow :-

The House crow also known as the Indian, greynecked, Ceylon or diamond crow, is a common kind of the crow family that is of Asian origin but now found in many parts of the world, where they arrived assisted by shipping. It is between the jay and the carrion crow in size but is similar than either. The forehead, crown, and the upper breast are a richly glossed black, whilst the neck and breast are a lighter grey-brown in colour. The wings, tails and legs are black. There are regional variations in the thickness of the bill and the depth of colour in areas of the plumage.

Scientific Name :- Corvus splendens

Diet :- House crows feed largely on refuse around human habitations, small reptiles, and mammals and other animals such as insects and other small invertebrates, eggs, nestlings, grains and fruits.

Distribution :- It has a widespread distribution in southern Asia, being native to Nepal, Bangladesh, India, Pakistan, Sri Lanka, Maldives, southern Myanmar, Thailand, and coastal Southern Iran.

Habitat :- House crows roost commonly near human habitations and often over busy streets, close to food sources in tall trees with dense crowns that were separated from other trees.

Lifespan :- The lifespan of crows in the wild is upto 15 years to 20 years. Crows under very special care are known to live upto 30 years.





Spotted Dove :-

The spotted Dove or eastern Spotted Dove is a small and somewhat longtailed pigeon that is common ~~resident~~ resident breeding kind across its Native range on the Indian Subcontinent and in East and Southeast Asia. The ~~spices~~ species has been introduced to many parts of the world and feral populations have become established.

Scientific Name :- Spilopelia chinensis

Diet :- They feed on grains, seeds and scraps. The birds are seen alone or in small flocks, feeding mostly on the ground. Some seeds may be taken in trees and bushes, and birds often enter animal houses, such as chicken coops, to feed on the commercial food.

Distribution :- The spotted dove in its Native range in Asia is found across a range of habitats including woodland, scrub, farmland and habitation. In India they are tend to be found in the moister regions, with the laughing dove appearing ~~in~~ more frequently in drier regions.

Habitat :- They are most commonly found across woodland, scrub, farmland and habitation.

Lifespan :- They have a maximum lifespan of 16 years.





Asian Koel :-

The Asian Koel is a member of the cuckoo order of birds, the Cuculiformes. It is found in the Indian Subcontinent, China and Southeast Asia. It forms a superspecies with the closely related black-billed Koels and Pacific Koels and sometimes treated as subspecies. The Asian Koel like many of its related cuckoo kin is a brood parasite that lays its eggs in the nests of crows and other hosts, who raise its young. They are unusual among the cuckoos in being largely frugivorous as adults. The name koel is echoic in origin with several language variants. The bird is a widely used symbol in the Indian and Nepali poetry.

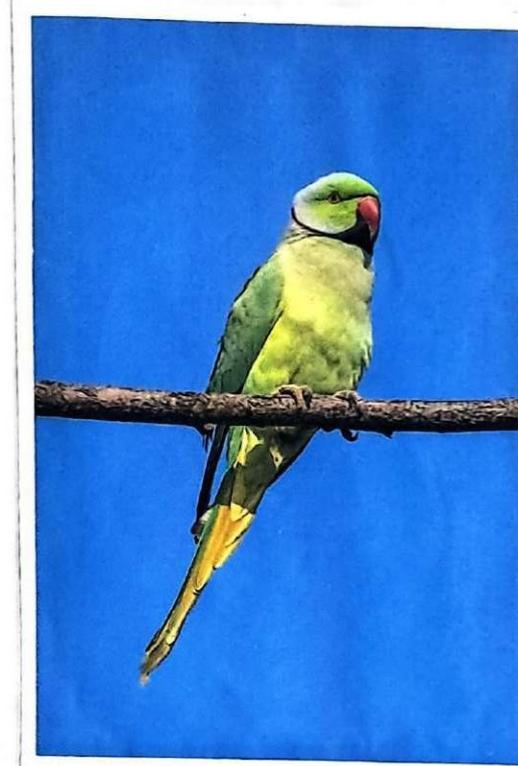
Scientific Name :- Eudynamis scolopacea.

Diet :- The Asian Koel is omnivorous, consuming a variety of insects, caterpillars, eggs and small vertebrates. Adults feed mainly on food.

Distribution :- It is mainly resident breeder in tropical southern Asia from Iran, Pakistan, India, Bangladesh, and Sri Lanka to the southern China and the greater Sunda.

Habitat :- The Asian Koel is a bird of light woodland and cultivation.

Lifespan :- These birds were once very popular in India as cagebirds. Feeding even on boiled rice, these hardy birds lived in captivity for as long as 14 years.





Rose-ringed Parakeets :-

The Rose-ringed Parakeet, also known as the ringneck parrot or the Kramen Parrot is a medium-sized parrot in the genus *Psittacula*, of the family *Psittacidae*. It has disjunct native ranges in Africa and the Indian Subcontinent, and is now introduced into many other parts of the world where feral populations have established themselves and are bred for the exotic pet trade.

Scientific name :- *Psittacula krameri*

Diet :- Eats Date palm, Mulberries, Pigeon pea

Distribution :- Since the 19th century, the rose-ringed parakeet has successfully colonised many other countries. It breeds further north on a large scale in Germany, France, Belgium, the Netherlands, Italy and the UK.

Habitat :- They can be found in grasslands, savanna, shrubland, rainforests, mangroves and wetlands. These birds also occur in rural gardens and agricultural areas.

Lifespan :- 20-30 years lifespan.

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ECOLOGICAL

IMPORTANCE

OF BIRDS

- ① Seed dispersal and pollination :-
Birds aid in plant reproduction by dispersing seeds and transferring pollen between flowers.
- ② Pest control :-
Birds help to regulate insect populations, and thus reducing the need for chemical pesticides.
- ③ Nutrient Cycling :-
They contribute to nutrient cycling by scavenging carrion, returning nutrients to the soil.
- ④ Indicator Species :-
Changes in bird population can signal broader environmental issues, serving as indicators of ecosystem health.
- ⑤ Biodiversity maintenance :-
Birds occupy various niches and support complex food webs promoting biodiversity and ecosystem resilience.





MODERN THREATS TO BIRDS

① Habitat loss :-

Due to urbanization, agriculture and deforestation, birds lose their natural habitats, leading to population declines.

② Climate Change :-

Altered weather patterns, habitat disruption and rising temperatures are affecting bird migration, breeding and food availability.

③ Pollution :-

Pollution from chemical, plastics and oil spills harms birds through contamination of water, air and food sources.

④ Invasive species :-

Non-native species can outcompete or prey upon native birds, disrupting ecosystems and reducing bird populations.

⑤ Collisions :-

Birds collide with man-made structures like buildings, wind turbines, and power lines, leading to injury and mortality.



BIRD

CONSERVATION

① Habitat Protection :-

Protecting natural habitats for birds like forests, wetlands and grasslands is crucial for bird survival.

② Threat Reduction :-

Mitigating threats such as habitat loss, pollution and climate change helps to safeguard bird population.

③ Species Monitoring :-

Regular monitoring of bird populations helps to identify declines and inform conservation actions.

④ Public Awareness :-

Educating the public about the importance of birds and how to help conserve them fosters support for conservation efforts.

⑤ Community Involvement :-

Engaging local communities in bird conservation initiatives, promote stewardship and sustainable practices.



CONCLUSION

In conclusion, native bird species play a vital role in ecosystems through their ecological contributions, such as seed dispersal, pest control, and nutrient cycling. However, they face numerous modern threats that endanger their populations and stability of ecosystems. Habitat loss, climate change, pollution, invasive species, and collision with man-made structures pose significant challenges to bird survival. It is imperative to recognize and address these threats through conservation efforts, habitat restoration, sustainable practices, and public awareness initiatives. By protecting native bird species and their habitats, we can safeguard biodiversity, maintain ecosystem balance, and ensure a healthier planet for future generations.

14



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on

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in Environmental Studies

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