UNIVERSITY OF CALCUTTA

Notification No. CSR/ 12 /18

It is notified for information of all concerned that the Syndicate in its meeting held on 28.05.2018 (vide Item No.14) approved the Syllabi of different subjects in Undergraduate Honours / General / Major courses of studies (CBCS) under this University, as laid down in the accompanying pamphlet:

List of the subjects

Sl. No.	Subject	Sl. No.	Subject
1	Anthropology (Honours / General)	29	Mathematics (Honours / General)
2	Arabic (Honours / General)	30	Microbiology (Honours / General)
3	Persian (Honours / General)	31	Mol. Biology (General)
4	Bengali (Honours / General /LCC2 /AECC1)	32	Philosophy (Honours / General)
5	Bio-Chemistry (Honours / General)	33	Physical Education (General)
6	Botany (Honours / General)	34	Physics (Honours / General)
7	Chemistry (Honours / General)	35	Physiology (Honours / General)
8	Computer Science (Honours / General)	36	Political Science (Honours / General)
9	Defence Studies (General)	37	Psychology (Honours / General)
10	Economics (Honours / General)	38	Sanskrit (Honours / General)
11	Education (Honours / General)	39	Social Science (General)
12	Electronics (Honours / General)	40	Sociology (Honours / General)
13	English ((Honours / General/ LCC1/ LCC2/AECC1)	41	Statistics (Honours / General)
14	Environmental Science (Honours / General)	42	Urdu (Honours / General /LCC2 /AECC1)
15	Environmental Studies (AECC2)	43	Women Studies (General)
16	Film Studies (General)	44	Zoology (Honours / General)
17	Food Nutrition (Honours / General)	45	Industrial Fish and Fisheries – IFFV (Major)
18	French (General)	46	Sericulture – SRTV (Major)
19	Geography (Honours / General)	47	Computer Applications – CMAV (Major)
20	Geology (Honours / General)	48	Tourism and Travel Management – TTMV (Major)
21	Hindi (Honours / General /LCC2 /AECC1)	49	Advertising Sales Promotion and Sales Management –ASPV (Major)
22	History (Honours / General)	50	Communicative English –CMEV (Major)
23	Islamic History Culture (Honours / General)	51	Clinical Nutrition and Dietetics CNDV (Major)
24	Home Science Extension Education (General)	52	Bachelor of Business Administration (BBA) (Honours)
25	House Hold Art (General)	53	Bachelor of Fashion and Apparel Design – (B.F.A.D.) (Honours)
26	Human Development (Honours / General)	54	Bachelor of Fine Art (B.F.A.) (Honours)
27	Human Rights (General)	55	B. Music (Honours / General) and Music (General)
28	Journalism and Mass Communication (Honours / General)		

The above shall be effective from the academic session 2018-2019.

SENATE HOUSE
KOLKATA-700073
The 4th June, 2018

Spaul 4/6/18
(Dr. Santanu Paul)
Deputy Registrar

UNIVERSITY OF CALCUTTA

CBCS SYLLABUS OF ZOOLOGY

2018

F

O

R

THREE-YEAR HONOURS

DEGREE COURSE OF STUDIES

Unit 4: Ecosystem	8
Types of ecosystem with an example in detail, Food chain: Detritus and grazing food chains, Linear and Y-shaped food chains, Food web, Energy flow, Ecological pyramids and Ecological efficiencies; Nitrogen cycle.	
Unit 5: Applied Ecology	7
Types & level of biodiversity Mega-diversity countries, Biodiversity Hot spot, Flagship species, Keystone species, Wildlife Conservation (*in situ* and *ex situ* conservation), concept of protected areas. Red data book, Indian wild life act & Schedule. Concept of corridor, advantages and problem of corridor. Threats to survival and conservation strategies for Tiger, Olive ridley, White Rumped Vulture.	

Ecology Lab, ZOOA-CC5-11-P

Full Marks 30	**60 Hours**	2 Credits
List of Practical		

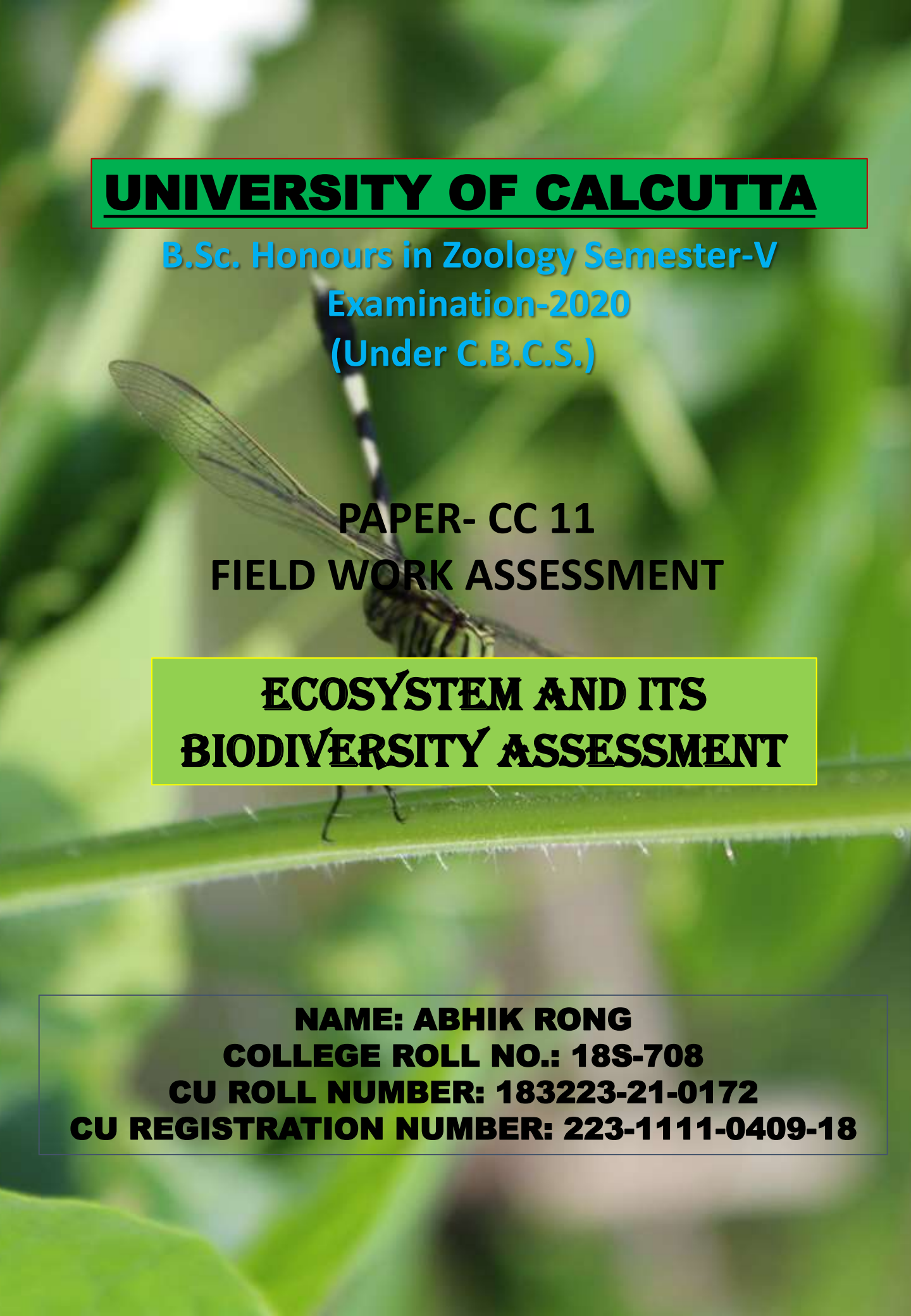
1. Determination of population density in a natural/hypothetical community by quadrate method and calculation of Shannon-Weiner diversity index for the same community
2. Study of an aquatic ecosystem: Phytoplankton and zooplankton, Measurement of area, temperature, salinity, determination of pH, and Dissolved Oxygen content (Winkler's method), Chemical Oxygen Demand and free CO_2
3. Report on a visit to National Park/Biodiversity Park/Wild life sanctuary/ any place of ecological interest/ ecological uniqueness/ Zoological garden

PART III: SEMESTER 5

CORE COURSE 12.Principle of Genetics

ZOOA-CC5-12-TH

Full Marks 50	4 Credits	Class
Unit 1: Mendelian Genetics and its Extension		12
Principles of inheritance, Incomplete dominance and co-dominance, Epistasis, Multiple alleles, Isoallele (White eye mutations), Pseudoallele (Lozenge Locus) & Cis-trans test for allelism, Lethal alleles, Pleiotropy, Penetrance & Expressivity		
Unit 2: Linkage, Crossing Over and Linkage Mapping		8
Linkage and Crossing, Complete & Incomplete Linkage, Measuring Recombination frequency and linkage map construction using three factor crosses, Interference and coincidence Sex linkage in *Drosophila* (White eye locus) & Human (Haemophilia).		



UNIVERSITY OF CALCUTTA

B.Sc. Honours in Zoology Semester-V
Examination-2020
(Under C.B.C.S.)

PAPER- CC 11
FIELD WORK ASSESSMENT

ECOSYSTEM AND ITS BIODIVERSITY ASSESSMENT

NAME: ABHIK RONG
COLLEGE ROLL NO.: 18S-708
CU ROLL NUMBER: 183223-21-0172
CU REGISTRATION NUMBER: 223-1111-0409-18

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ABSTRACT

- This project on “ECOSYSTEM AND ITS BIODIVERSITY ASSESSMENT ” prepared encompasses the description of various ecosystems present in the Tadoba Andheri Tiger Reserve (Chandrapur, Maharashtra, India), Bor Tiger Reserve (Manoli, Maharashtra). It also contains an account of the diverse flora and fauna that are found there. An attempt has been made herein to present an idea about the different kinds of animals present in their distribution. The number of individuals of different species of animals as observed during the jungle safaris have been recorded and presented. The use of Shannon Weiner’s Biodiversity Indices has been used to explain the dominance and richness of the species that were observed during the safaris. Apart from that, an account of the activities that we did to study the diversity of invertebrate fauna (particularly arthropods) also has been presented. To explain the population of animals in the forest ecosystem (a rough idea) the use of numerous pie chart have been made

OBJECTIVE

The objectives for this project on “ECOSYSTEM AND ITS BIODIVERSITY ASSESSMENT” are as follows

- ✓ To have an idea about the structure and functioning of the ecosystem.
- ✓To gain knowledge about the biodiversity in general.
- ✓To examine the varieties of ecosystems and biodiversity found conservation areas.
- ✓To understand how different species of animals interact with the environment and components.
- ✓To have an idea about the different kinds of habitats and ecosystems present in the protected places we went to.
- ✓To have knowledge about different species of animals found in the national parks and sanctuaries.
- ✓To study the diversity pattern of fauna.
- ✓To understand faunal dominance and evenness in the distribution of fauna.
- ✓To predict the uncertainty in the ecosystem.
- ✓To learn to identify the different varieties of fauna.
- ✓To build a knowledge regarding the correlation of ecosystem and biodiversity.

ECOSYSTEM- BRIEF INTRODUCTION

The word ‘ecosystem’ was coined by A.G.Tansley in 1935.

According to Eugene.P.Odum (1983), “Any unit that includes all the organisms that functions together in a given area interacting with the physical environment so that a flow of energy leads to clearly defined biotic structures and non living parts is an ecological system or ecosystem.”

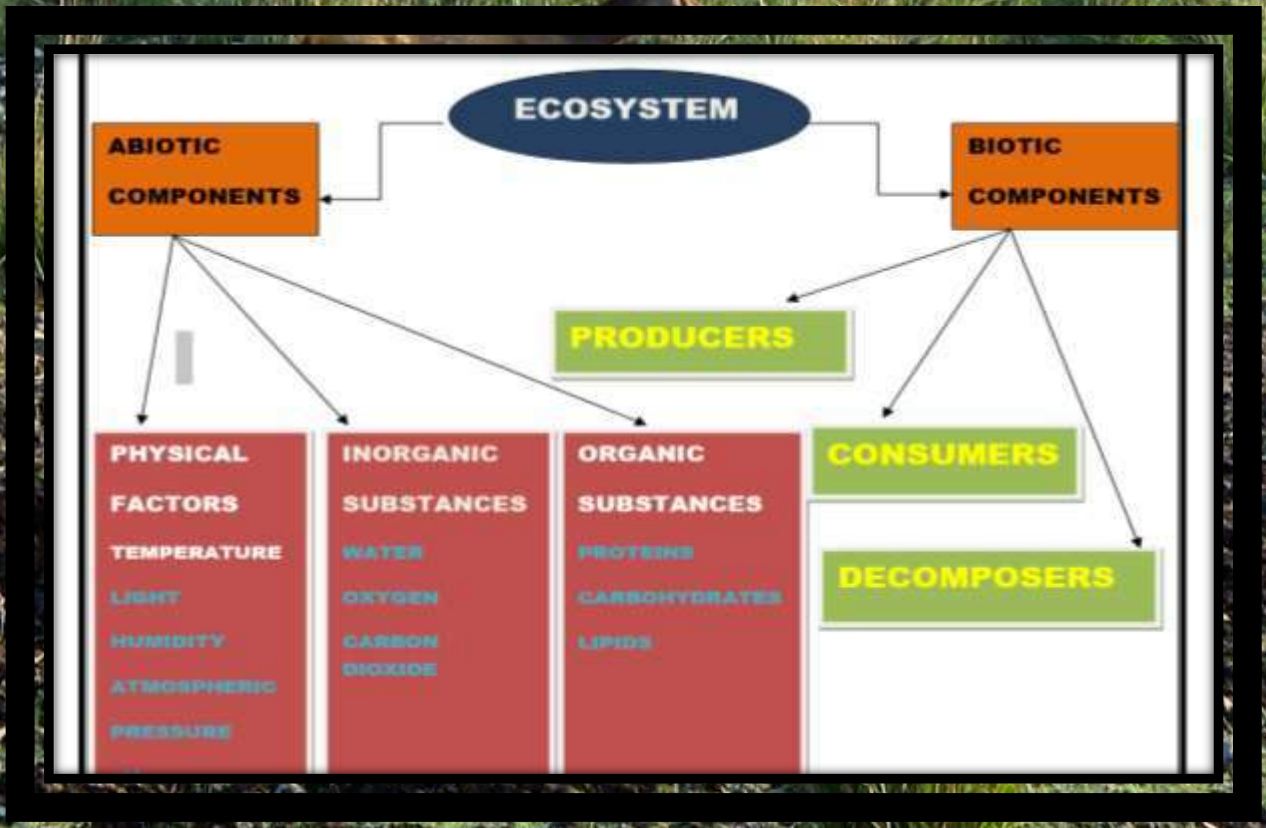
Lake ecosystem

Ecosystem is the largest functional unit of ecology

COMPONENTS OF AN ECOSYSTEM

According to E.P.Odum, the components of an ecosystem are

A flowchart of Ecosystem



TERRESTRIAL ECOSYSTEMS

FOREST ECOSYSTEM:

Forests have community of plants having trees, shrubs, herbs and climbers. Forest trees show random growth they do not grow in rows as observed in plantation by man. In a natural forest, trees grow in communities such as Teak-*Terminalia* community or *Zizyphus* acacia community. Wild animals are very important part of forest ecosystem.

GRASSLAND ECOSYSTEM:

A grassland ecosystem is a collection of plants, animals and microorganisms that live in an environment where grasses are the primary sources of vegetation.

AQUATIC ECOSYSTEMS

Types of Aquatic Ecosystems:

1. **Lentic System:** It refers to stationary or relatively still water. Lentic water is considered to be present in ponds, lakes, and wetlands.

   Characteristics:

   - ❖ There is a marked stability in the physicochemical properties of water.
   - ❖ There are thermal stratifications as well as that of oxygen and nutrients.
   - ❖ They are closed systems.
   - ❖ Light illuminates only the upper layers- the limnetic zone, where active photosynthesis and growth occurs which results in plenty of oxygen and rapid consumption of nutrients. Profundal and benthic zones are dark. Some oxygen also dissolves in the surface water from the atmosphere above.

Zonation:

❖ **Littoral Zone:** The zone around the margins of a water body which consists of shallow waters. Plenty of light is available and rooted plants can grow in this zone only.

❖ **Limnetic Zone:** It is the zone of open waters which are deeper as well. Available of plenty of light promotes active photosynthesis and growth of free floating autotrophs- the planktons.

❖ **Profundal Zone:** This zone occurs under the limnetic zone and receives very little light. Hence, it can be referred to as aphotic zone in contrast to euphotic zone. (limnetic and littoral), which are well illuminat The ed.

❖ Benthic zone: It lies under the Profundal zone, which is at the bottom region of the water body. Both profundal and benthic zones are characterized by the presence of heterotrophs which live on dead and decaying organic matter.

1. **Lotic System:** They are those systems which contain flowing waters, the basic function of the lotic bodies of water is to carry the surplus rain water back to the sea.

Characteristics:

❖ There is a continuous unidirectional flow in a lotic ecosystem.

❖ Plenty of oxygen is derived from air above which is evenly distributed throughout the water mass. To this, is added the oxygen produced by the autotrophs. Oxygen depletion is therefore, rare in unpolluted lotic waters.

❖ Turbidity usually limits light penetration to deeper zones of lotic systems.

❖ The physiochemical properties of water are also in a state of perpetual change. Stratification and stagnation are altogether absent.

Zonation:

According to illies and Botosaneanu (1963), two major subdivisions have been recognized:

- **Ritthorn Zone: It is the steep and torrential upper course. It is also called Rapid Zone. It is characterized by steep, narrow, shallow and turbulent rifles or rapids.**
- **Potamon Zone: It is the flat slow running lower course. It is also called the Pool Zone. It is the flatter, wider and deeper pool.**

As a part of our project on ECOSYSTEM ASSESSMENT, we conducted studies on the Forest and Aquatic ecosystems, assessing the various abiotic and biotic components of it

BIODIVERSITY-BRIEF INTRODUCTION

DEFINITION

The term Biodiversity was popularized by socio-biologist Edward Wilson to describe the combined diversity or heterogeneity at all the levels of biological organization right from macromolecules within the cells, genes, species, ecosystems and biomes.

TYPES OF BIODIVERSITY

1. GENETIC DIVERSITY:

Genetic Diversity is a measure of variety in genetic information contained in the organisms. Within a species, genetic diversity occurs in the differences of alleles, entire genes and chromosomal structures. More than 50000 genetically different strains of rice and 1000 varieties of mango occur in India due to genetic variations.

2. SPECIES DIVERSITY:

It refers to the variety of species within a region. For example, Western Ghats have greater amphibian diversity as compared to Eastern Ghats.

3. ECOLOGICAL DIVERSITY:

It is the variety of ecosystems which indicate diversity in the number of niches, trophic levels, food webs, nutrient cycles and ecological processes sustaining energy flow. For example, ecosystem diversity is high in India because of the occurrence of a large number of ecosystems.

LEVELS OF BIODIVERSITY

1. ALPHA DIVERSITY:

It refers to the diversity within a particular area or ecosystems and is usually expressed by the number of species in that ecosystem.

2. BETA DIVERSITY:

It refers to the diversity of species between two separate ecosystems.

3. GAMMA DIVERSITY:

It is a measure of the overall diversity for the different ecosystems present in a community.

HOW MANY SPECIES ON EARTH AND HOW MANY IN INDIA?

According to the International Union of Conservation Of Nature and Natural Resources (IUCN, 2004), the total number of plant and animal species described so far is slightly more than 1.5 million, but there is no clear idea of how many species are yet to be discovered and described.

1. Number of animal species is more than 70%. Plants (including algae, fungi, bryophytes, gymnosperms, and Angiosperms) account for nearly 22% of the total.

2. Among animals, insects are the most species-rich taxonomic group, making more than 70% of the total, out of every 10 animals on this plant, 7 are insect.

3. Number of fungi species (72000) in the world is more than the combined total of the species of fishes (28000), amphibians (4780), reptiles (7150) and mammals (4650).

PROCESS AND SIGNIFICANCE:

The approach to studying biodiversity is a complete process, as one has to take into account a number of variables like where biodiversity is, how it is changing over space and time, the drivers responsible for such change, the consequences of such change for ecosystem services and human well being and response options available. In spite of many tools and data sources, biodiversity remains difficult to quantify precisely.

We did the biodiversity assessment of the Tadoba National Park and Bor Tiger Reserve. and the data has been presented in this report.

TOUR ITINERARY

- 23rd February,2020: Left Howrah station by train, Gitanjali express (12860) at 1:40 PM for Nagpur.
- 24th February,2020: Reached Nagpur at morning. Transport to Tadoba. Stayed overnight at Tadoba
- 25th February,2020: Educational fieldwork throughout the day. Stayed overnight at Tadoba.
- 26th February,2020: Set off for Bor in the morning. Stayed overnight at Bor.
- 27th February,2020: Educational fieldwork throughout the day. Stayed overnight at Bor.
- 28th February,2020: set off for Nagpur at early morning to board train. Azad Hind Express (12129) at 10:10 AM.
- 29th February,2020: Reached Howrah in noon.

ACCOMODATION:

1. Tadoba Andhari Tiger Reserve government rest house.
2. Bor Tiger Reserve government cottage

ACCOMPANIED BY:

1. **Prof. Swagata Chattapadhyay**
2. **Sri. Sunil Kumar Pramanik**

THE GROUP PHOTO OF THE ZOOLOGY HONOURS STUDENTS ALONG WITH THE TEACHERS IN-CHARGE FOR THE EXCURSION

MATERIALS AND METHODS

In order to study the ecosystem and Biodiversity of the two National park and Sanctuary we went to the following activities are performed.

- Assessment of Abiotic Components
- Assessment of Biotic Components

❑ASSESSMENT OF ABIOTIC COMPONENTS

➢Measurement of air temperature :

A laboratory thermometer graduated in Centigrade scale (Celsius scale) was used for the purpose. The thermometer was held in mid air and the temperature was recorded.

➢Measurement of pH of soil sample:

50 gram of soil sample was taken in a Petri-dish and 10ml of water was added to it. Such that the soil was partially wet. A pH paper was taken and it was dipped in the soil sample mixed with water and the pH value was recorded.

MATERIALS AND METHODS

❑ASSESMENT OF BIOTIC COMPONENTS

➢Safari:

Jungle Safari can also be defined as a forest trail, except that instead of walking, hiking, one can also get the option of exploring the forest regions via jeep or an Elephant or a Horse. The Jungle Safari not only involves exploring a particular region of a jungle but also National Parks and Wildlife Sanctuaries as well as protective reserves.

We need to carry Binoculars (Olympus), Cameras (Canon IXUS 185 digital camera, Canon EOS 3000D digital Camera), notepad and pens for the purpose. The forest tourist guides and our teacher professor Swagata Chattopadhyay helped us to identify the various fauna we observed. Also used literature sources like “BIRDS OF THE INDIAN SUBCONTINENT” by Richard Grimmett for identification of many Birds. We recorded the names, number of individuals seen and also photographed them. These details were used to calculate the diversity indices.

MATERIALS AND METHODS

➢ PITFALL TRAPS

Pitfall trapping is a sampling technique which is widely used in studies of seasonal occurrence, to examine spatial distribution patterns, to compare relative abundance in different micro-habitats, to study daily activity rhythms, and in community surveys, of various organisms.

➢STRUCTURE AND COMPOSITION:

Pitfall traps come in a variety of sizes and designs. They come in two main forms; Dry and wet pitfall traps. Dry pitfall traps consists of a container the ground with its rim at surface level use to trap mobile animals that fall into it. Wet pitfall traps are basically the same but contain a solution designed to kill and preserve the trapped animals. The fluids used in these traps are formalin (10% formaldehyde), methylated spirits, alcohol, Ethelene glycol, trisodium phosphate, picric acid, or even plain water. A little amount of detergent is added to break the surface tension of the liquid to promote quick drowning. The opening is usually cover with a lid. This is done to reduce the amount of rain and debris entering the trap and to prevent animals in dry traps from drowning or over heating as well as to keep out predators. Traps may also be baited. Baits of varying specificity can be used to increase the capture rate of a target species or group by placing them in above or near the trap. Examples of baits includes meat, dung, fruit , sugar and pheromons.

MATERIALS AND METHODS

APPARATUS USED

- Small garden shovels
- Measuring tape
- Spatula
- Small equal sized containers for in-situ organism trapping
- Soap/Detergent water
- Edible sugar to lure the organisms into the traps
- Forceps
- Blotting paper
- Ethanol
- Measuring cylinder
- Distilled water
- Large container for storage of organisms collected

MATERIALS AND METHODS

PROCEDURE

For the collection of invertebrate specimens, wet pitfall traps are advisable. The wet pitfall traps we used consisted of a small plastic container set in a cavity dug into the earth. The container contained soap water for partial immobilization of invertebrate organisms that happened to topple into it. 4 such containers each of equal size were set one at each corner of a square of side 1 m and 1 container placed at the centre. The traps were left as such for 24 hours for collection of organisms.

The organisms thus collected were then removed from the soap water and soaked on a blotting paper. Then they were placed in 70% ethanol taken in another container for preservation. The invertebrate specimens thus collected generally consisted of a diversity of ants, spiders etc. Our teachers Professor Swagata Chattopadhyay helped us to identify the organisms collected. We also used literature sources like “Introduction To The Study Of Insects”, Borror and DeLong and the number of individuals of each type of organism was recorded and the data was obtained was used to calculate the Biodiversity Indices of organisms. Also, the organisms collected were photographed under an electronic magnifier.

MATERIALS AND METHODS

➢USES:

❑PITFALL TRAPS CAN BE USED FOR VARIOUS PURPOSES:

- Collectors and researchers of various ground dwelling Arthropod species may use pitfall traps to collect the animals they are interested in. This can be done with or without bait.
- When used in series these traps may also be used to estimate species richness and abundances and this combined information may be used to calculate biodiversity indices.

➢PROBLEMS:

There are inevitably biases in pitfall sampling when it comes to comparison of different group of animals and different habitats in which the trapping occurs. An animal's trap ability depends on the structure of it's habitat. Gullan and Cranston (2005) recommend measuring and controlling for such variations. Intrinsic properties of the animals itself also effect it's trap ability some taxa are more active than others, more likely to avoid the trap, less likely to be found on the ground or too large to be trapped.

MATERIALS AND METHODS

NOTE: The death of the huge number of Biological Entities, who sacrificed their lives as we executed our project by pitfall trap technique, who had an equal say in determining the biodiversity coefficient of the area, is highly regretted

Measurement of the corners of the square of length 1m

Digging small pits in the earth for the containers to fit in

Containers arranged on the corners of the square for pitfall trap

MATERIALS AND METHODS

- ➢ **QUADRAT:**

❖PRINCIPLE:

When an ecologist wants to know how many organisms there are in a particular habitat, it would not be feasible to count them all. Instead , he or she would be forced to count a smaller representative part of the population, called a sample. Sampling of plants or animals that do not move much (such as snails), can be done using a sampling square called quadrat. A suitable size of quadrat depends on the size of the organisms being sampled. For example, to count plants growing on a school field, one could use a quadrat with sides 0.5 or 1 meter in length.

❖APPARATUS USED:

1. Small garden shovels.
2. Forceps
3. Measuring tape
4. Insect pins
5. A kill jar container 70% alcohol
6. Ziplock packets and plastic containers
7. Labels
8. Iron poles
9. String
10. Magnifying glass
11. Newspaper for collection

MATERIALS AND METHODS

❖ METHOD:

A suitable site was selected for the quadrat work to be done. An area of 1sq m was measured and the region was demarcated with the help of a string. The string was fixed in a square form of 1mx1m and the corners were fixed with iron poles. Thus the quadrat was formed and various species of flora and fauna were collected with the help of forceps.

DIVERSITY INDEX

• INTRODUCTION:

A diversity index is a mathematical measure of species diversity in a community. Diversity indices provide more information about community composition than simply species richness. They also take the relative abundance of different species into account. When diversity indices are used in ecology the types of interest are usually species, they can also be other categories, such as genera, families, functional types or haplotypes.

• TYPES:

Many kinds of diversity indices can be used to study a community diversity. We have used the Shannon- Weiner index.

• IMPORTANCE:

Diversity indices provide important information about rarity and commonness of species in a community. The ability to quantify diversity in this way is an important tool for biologists trying to understand community structure .

SOME IMPORTANT TERMINOLOGIES

•Species Richness:

Species richness is the number of different species represented in an ecological community, landscape or region. It is simply a count of species, and it does not take into account the abundances of the species or relative abundance distribution.

•Species Evenness:

It refers how close in number each species in an environment is.

•Species Dominance:

It gives an idea about the species whose population is highest in the community.

❑SHANNON-WEINER INDEX:

It was proposed by Claude Shannon, 1948. It is a measure of uncertainty. It has no unit. It is only meaningful when we compare it with that of some other ecosystem. The idea behind this index is that the diversity of a community is similar to the amount of information in a code message. It is calculated in the following way:

$$H' = -\Sigma pi \ln pi$$

Where pi is the proportion of individuals found in species. For a well sampled community we can estimate this proportion as pi values will be between 0 and , natural log makes all of the terms of the summation negative, which is why we take the inverse of the sum.

INTERPRETATION:

Typical values are generally between 1.5 and 3.5 in most ecological studies, and the index is rarely greater than 4. The Shannon- Weiner index. Increases as both the richness and the evenness of the community increase. The fact that the index incorporates bot components of biodiversity can be seen as both strength and weakness. It is a strength because it provides a simple, synthetic summery, but it is a weakness as it makes it difficult to compare communities that differ greatly in richness.

Higher the value of Shannon-Weiner index greater is the uncertainty. Lower the Shannon- Weiner index more is the dominance. For calculation of species evenness(J) we use the formula,

$$J = H' / \ln S$$

Where S is the total number of species in the community.

TADOBA ANDHARI TIGER RESERVE

DATE OF ARRIVAL: 24TH February ,2020
TIME OF ARRIVAL: 1:00 pm
EVENTS: 1. Morning safari
2. Evening safari
3. Field work
DATE OF DEPARTURE: 26th February, 2020
TIME OF DEPARTURE: 9:00 am

HIGHLIGHTS

The Tiger Reserve is situated in the core area of the forest.

- **LOCATION:** Chandrapur, Maharashtra, India.
- One of the largest and oldest National Park.
- February to May is the best time to visit.
- **SEASONS:** Summer (February to July with temperature 30◦ - 47◦ C.

  Monsoon (mid June to October)

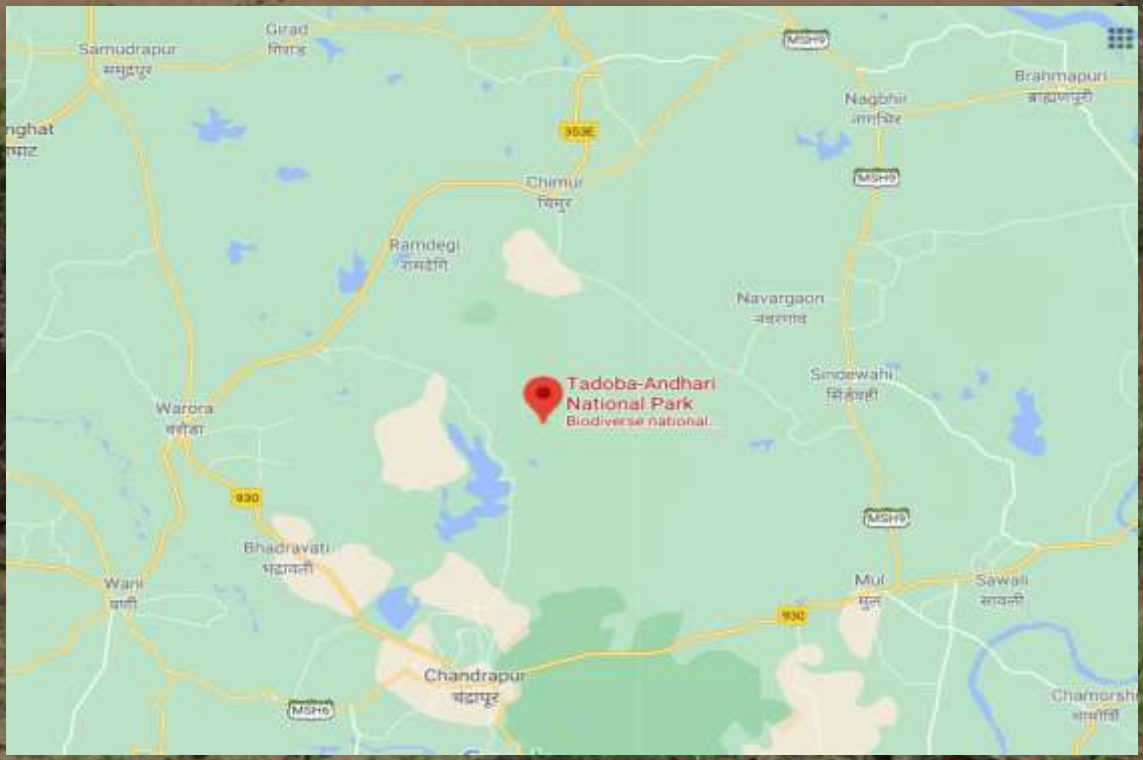
  Winter (November to the end of January with minimum temperature of 9◦ C.
- **RAINFALL:** 1175 mm annually slight rain also occurs in October/ November brought by North East wind.
- **WATER SOURCES:** tadoba river, Tadoba lake, Kolsa lake.

Morning safari

Into the wilderness

LOCATION

The area of the Tadoba Andhari Tiger Reserve falls in the 20◦ 25’ 50” – 20◦ 04’ 53” N latitude and 79◦ 33’ 34” East longitude. The entire area comes under the district of Chandrapur of Maharashtra state and involves Chandrapur, Bhadrawati, Chimur, Warora and Sindewani Tahsils. It has it’s offices at Tadoba. Tadoba lies 45 Km North of the district headquarter, Chandrapur and about 200 Km, from the other main city, Nagpur. The other fair weather motorable road stations are Chandrapur and Warora on the central railway. The nearest airport is Nagpur. Terrain of Tadoba Andhari Tiger Reserve is undulating with gently rolling hills covered with dry deciduous forest.



HOW TO REACH TO TADOBA

Nagpur can be reached from New Delhi 125 hours flight service. Flight services ply between major metros and Nagpur.

Nagpur is connected with all major cities of India by rail. State buses ply to various destinations while luxury buses are available for travel to Jabalpur in Madhya Pradesh.

Nagpur to Mohurli gate – 180 Km via Chandrapur.

Nagpur to Kuswanda gate – 140 Km via Chandrapur.

Nagpur to Kolara gate - 120 Km via Chandrapur.

Nagpur to Navegaon gate – 140 Km via Chandrapur.

Nagpur to Pangdi gate – 250 Km via Chandrapur.

Nagpur to Zari gate – 190 Km via Chandrapur.

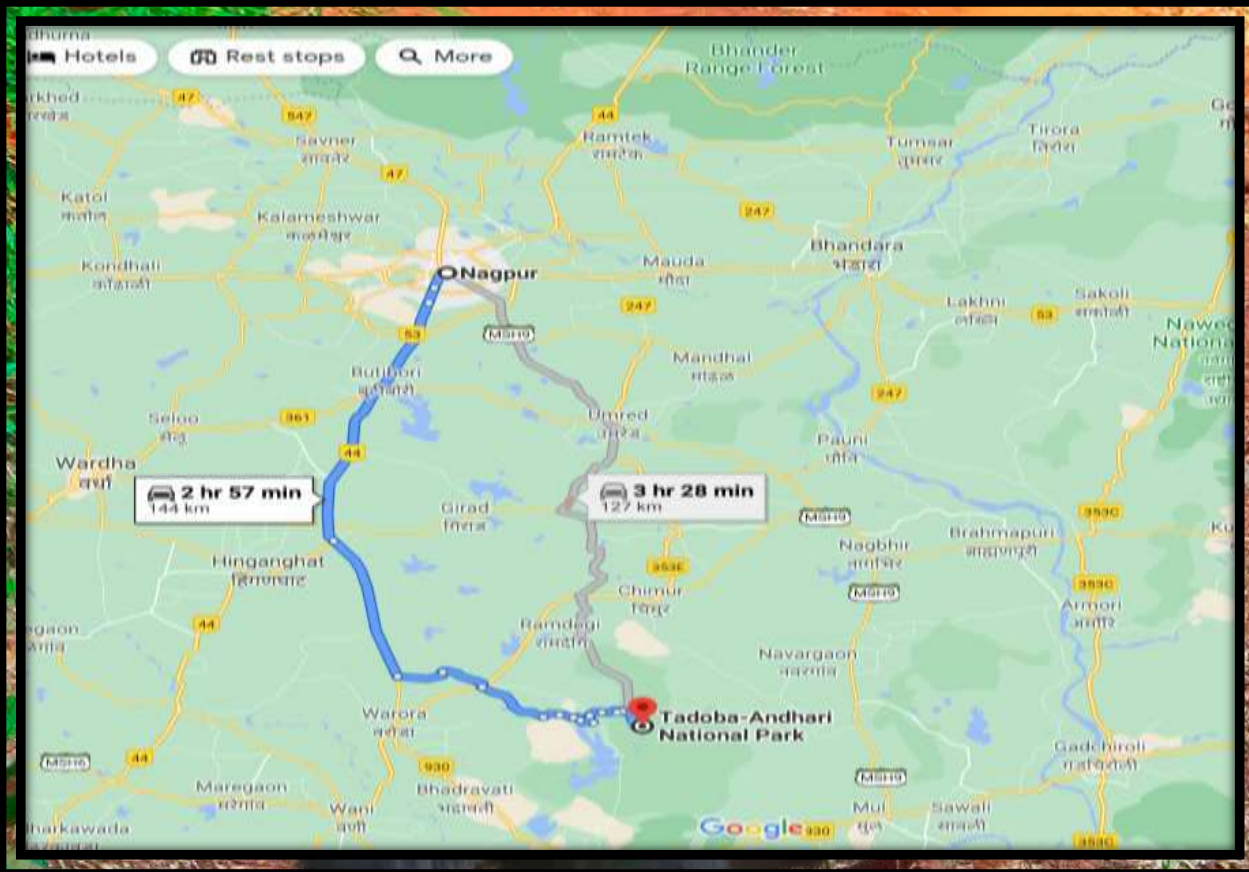
From Jabalpur to Nagpur – 280 Km.

Nagpur to Chandrapur – 100 Km.

Pench to Nagpur – 80 Km.

GATES TO TADOBA

1. Moharli gate
2. Kuswanda gate
3. Kolara gate
4. Navegaon gate
5. Pangdi gate
6. Zari gate



Road map from Nagpur city to Tadoba National Park

A picture of bird watching tower at Tadoba

GEOLOGICAL DIVERSITY

Vindhyan sand stones occur in almost all of the area which consists of sandstones, shales and lime stone. The shale is intercalated with limestone. The prominent rocks are the grained vitreous sandstone. Broad geological divisions can be made for Tadoba Andhari Tiger Reserve based on the disposition of the rock types. In North, a small patch of detrital mantle consists of alluvial deposits.

In South Western site the Gondwana sediments expose Kamathi formation and Lamteas at surface. Archaean metamorphic rocks as patches are present along the north east corner and in the Western border. The soil in the greater part is sandy with stretches of yellow brown and black loam.

The black cotton soil is found in the plains except where the forest are heavily degraded. On the slopes the soil layer is thin and vegetation is sparse. The tops of the hillocks are mostly barren with exposed rocks.

Geological diversity map of Tadoba Andhari Tiger Reserve

DRAINAGE AND WATER BODIES AT TADOBA

Tadoba is gifted with the centrally located magnificent 120 hectare, perennial natural water body. Tall and evergreen Jamun trees border this large reservoir and provide good nesting sites for a variety of birds. A good road runs along the periphery of this lake offering and excellent opportunity for ornithologist and wildlife observers. The rest houses in Tadoba are located in the Eastern bank of this graceful water body.

Andhari is the main river in the area. It originates from Pandharpauni in the Tadoba National Park and flows Southwards to join the river Wainganga. The portion of this river towards the South of Dewada-Kolsa road is perennial, whereas during it's course between Jamin and Dewad-Kolsa retain waters at pockets, which are termed "Dohs". Bhhanukundi nalla originates from Katezari in the Tadoba National Park and joins Erai river.

In addition to this streams and rivers as many as 10 large water tanks are available in the protected area, which are permanent water source. These tanks help in maintaining the water in pockets of downstream through seepage.

Besides these 7 more water tanks are available to quench the thirst. In spite of these water sources water remains scarce commodity particularly hot months of the year. Several water troughs especially constructed for use of wildlife have to be regularly filled in artificially. A tank of moderate size is also available at joining the rest house at Kolsa.

Tadoba Lake

PHOTOS OF THE JUNGLE

1. FOREST ECOSYSTEM:

Sites of Junona and Agarzari zone

2. GRASSLAND ECOSYSTEM

Sites of Agarzari and Junona zone

3. AQUATIC ECOSYSTEM

Sites of Junona and Agarzari zone

ENVIRONMENTAL ANALYSIS

➢MEASUREMENT OF AIR TEMPERATURE:

- **Date : 26.02.2020 – 27.02.2020**
- **Temperature at 6:45 pm: 17.5◦C**
- **Temperature at 8.45 am: 23◦C**

➢MEASUREMENT OF PH OF SOIL SAMPLE:

- **The soil collected from the area where we set the pitfall traps was used for PH analysis.**
- **Date of measurement: 26.02.2020 – 27.02.2020**
- **PH value: 7.3**

➢ COMMENTS:

Temperature are found to be moderate. The soil of the forested area was found to be alkaline. This indicates that the area has mostly clay soil with poor structure and low infiltration capacity. The soil has a low concentration of micronutrients.

FLORA OF TADOBA-ANDHARI TIGER RESERVE

- Teak, Ain, Bija, Haldi, Dhaoda, Bamboo, Haldi, Arjun, Tendu, Salai, Jamun, Semal, Beheda, hirda Karayagum and Lanneacoramandelica (Wodier tree), Black Plum trees, etc are found in Tadoba-Andhari Tiger Reserve.

ZOOLOGICAL DIVERSITY

- The Tadoba Andhari Tiger Reserve is very rich in faunal diversity. Among the many kinds of organisms found in Tadoba some are listed below as follows.

BIRDS

Serial no.	Common Name	Scientific Name
1.	Grey Jungle Fowl	*Gallus sonneratii*
2.	House Sparrow	*Passer domesticus*
3.	Spotted Dove	*Spilopelia chinensis*
4.	Black Drongo	*Dircurus macrocercus*
5.	Little egret	*Egretta garzetta*
6.	Rufous treepie	*Dendrocitta vagabunda*
7.	Jungle babbler	*Turdoides striata*
8.	Crested serpent eagle	*Spilornis cheela*
9.	Red vented bulbul	*Pycnonotus cafer*
10.	Common starling	*Sturnus vulgaris*
11.	Shikra	*Accipiter badius*
12.	Black headed ibis	*Threskiornis melanocephalus*

Serial no.	Common Name	Scientific Name
13.	White throated kingfisher	*Halcyon smyrnensis*
14.	Indian spot bill duck	*Anas poecilorhyncha*
15.	Green bee eater	*Merops orientalis*
16.	Little grebe	*Tachybaptus ruficollis*
17.	Open billed stork	*Anastomus oscitans*
18.	Cotton pygmy goose	*Nattapus coromandelianus*
19.	Bronze winged jacana	*Metopidius indicus*
20.	Red wattled lapwing	*Vanellus indicus*
21.	Grey heron	*Ardea cinerea*
22.	Indian cormorants	*Phalacrocorax fuscicollis*
23.	whistling duck	*Dendrocygna sp.*
24.	Lesser adjutant stork	*Leptoptilos javanicus*
25.	Grey headed fish eagle	*Ichthyophaga ichthyaetus*
26.	Glossy ibis	*Plegadis falcinellus*
27.	Yellow footed green pigeon	*Treron phoenicoptera*
28.	Peafowl	*Pavo cristatus*
29.	Peahen	*Pavo cristatus*
30.	Indian roller	*Curacias benghalensis*
31.	Magpie robin	*Copsychus saularis*
32.	Euresian thick knee	*Burhinus oedicnemus*
33.	Grey hornbill	*Ocyceros birostris*

MAMMALS

Serial no.	Common Name	Scientific Name
1.	Spotted deer	*Axis axis*
2.	Indian gaur	*Bos gaurus*
3.	Grey langur	*Semnopithecus sp.*
4.	Sloth bear	*Melursus ursinus*
5.	Tiger	*Panthera tigris*
6.	Wolf	*Canis lupus*
7.	Jackal	*Canis aureus*
8.	Wild dog	*Cuon alpines*
9.	Fox	*Vulpes sp.*
10.	Hyena	*Hyaena hyaena*
11.	Sambar deer	*Rusa unicolor*
12.	Wild boar	*Sus scrofa*
13.	Blue bull	*Boselaphus tragocamelus*
14.	Porcupine	*Hystrx indica*
15.	Rhesus macaque	*Macaca mulatta*
16.	Leopard	*Panthera pardus*
17.	Jungle cat	*Felis chaus*
18.	Rusty spotted cat	*Prionilurus rubiginiosus*
19.	Indian pangolin	*Manis sp.*
20.	Four horned antelope	*Tetracerus quadricornis*
21.	Barking deer	*Muntiacus muntjak*

TIGER AS A KEY STONE SPECIES

- A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether. A keystone species is often but not always a predator.
- Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex predator can regulate species abundance, distribution, diversity; which in turn can impact the health of terrestrial habitats.
- Additionally they provide essential food sources for the grazers and remove the sick and weak from population of prey species.
- The decimation of these important tiger species can have cascading effects throughout the ecosystem they inhabit, resulting in economically and ecologically devastating consequences.
- In Tadoba National Park the keystone species is Tiger.
- Tiger is the largest of the world's great cat. Tiger, gaur, sambar deer, chital deer, blue bull help to maintain wildlife population.

PUG MARKING

Pug mark is the term used to refer the footprint of most animals. "Pug" means foot in Hindi. Every individual animal species has a distinct pug marks used for identification of different species.

Importance of pug marks:

A. Wildlife conversationists are known to catalogue pug marks in the area they operate.
B. Pug marks are also used for tracking rogue animals which may be in danger to mankind or even to themselves because of injuries etc.
C. It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the fields.

Tigress Madhuri

Pug marks of tiger

JUNGLE SAFARIES AND FIELDWORK FOR BIODIVERSITY ASSESSMENT

We did two jungle safaris as well as field work activities such as pitfall traps in Tadoba National Park in order to have a clear idea of its bio diversity. We went for the first safari on the morning of 25th February,2020 which started at 6:00 am and ended at 10:00 am.

We went for the second safari in the afternoon of 25th February,2020 which started at 2:00 pm and ended at 6:00 pm.

We set the pitfall traps in the evening of 24th February,2020 at about 3:00pm in the Junona zone of the reserve which in itself is an ecotone area. The traps were collected after 24 hours that is, the morning of 26th February,2020 at about 7:00 am.

The data collected from all these activities has been presented in the next pages in the form of a census report.

Pictures of us taken during the morning safari

1. MORNING SAFARI

Date :25.02.2020
Zone : Junona zone
Started at: 6:00 am
Ended at: 10:00 am

Picture taken just outside the Junona zone gate

We went on the morning safari in a gypsy to the Tadoba Andhari Tiger reserve. The fauna observed and their corresponding number was recorded as follows.

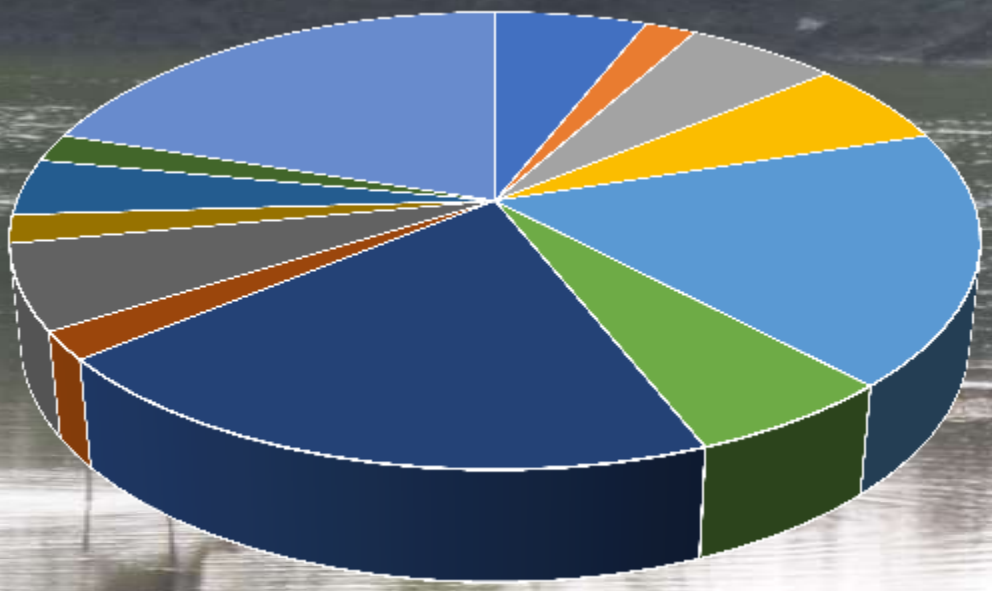
Serial number	Common Name	Scientific Name	Number of individual seen
1.	Spotted deer	*Axis axis*	17
2.	Grey jungle fowl	*Gallus sonneratii*	3
3.	House sparrow	*Passer domesticus*	1
4.	Indian gaur	*Bos gaurus*	23

Serial no.	Common Name	Scientific Name	Number of individuals seen
5.	Sotted dove	*Spilopelia chinensis*	3
6.	Black drongo	*Dircurus adsimillis*	3
7.	Little egret	*Egretta garzetta*	9
8.	Rufous treepie	*Dendrocitta vagabunda*	3
9.	Jungle babbler	*Turdoides striata*	10
10.	Crested serpent eagle	*Spilonnis cheela*	1
11.	Red vented bulbul	*Pycnonotus cafer*	3
12.	Common starling	*Sturnus vulgaris*	1
13.	Peacock	*Pavo cristatus*	2
14.	Grey langur	*Semnopithecus sp.*	1
15.	Shikra	*Accipiter badius*	1
16.	Black headed ibis	*Threskiornis melanocephalus*	10
17.	tigress	*Panthera tigris*	3

CHART REPRESENTATION OF BIODIVERSITY

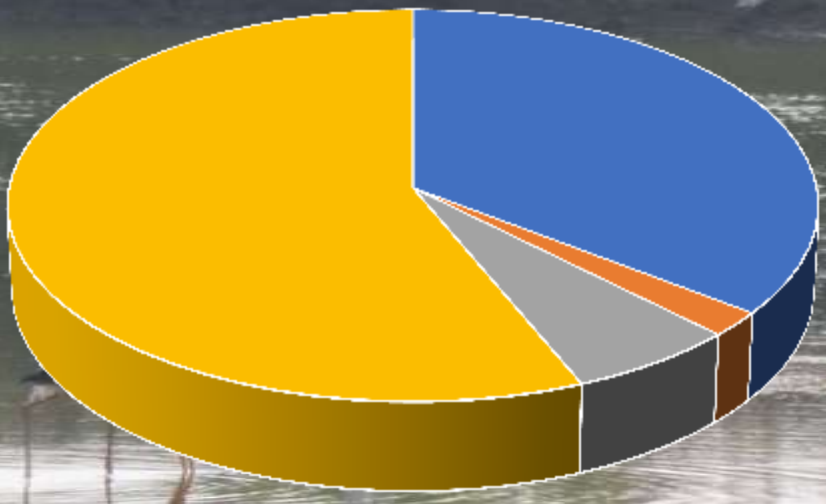
Based on the above data the fauna observed has been ststistically representated as under:

Avian Fauna



On the basis of the Pie chart drawn for avian fauna we conclude that the dominant species are Jungle babbler and Black headed Ibis each represented by 10 individuals.

Mammalian Fauna



On the basis of the Pie Chart drawn for mammalian fauna we conclude that the dominant species is Indian Gaur represented by 23 individuals.

2. AFTERNOON SAFARI

- **Date:25th February 2020**
- **Zone: Agarzari zone**
- **Started at: 2:00pm**
- **Ended at: 6:00pm**

Picture taken before entering the Agarzari zone

Group picture clicked during Afternoon safari

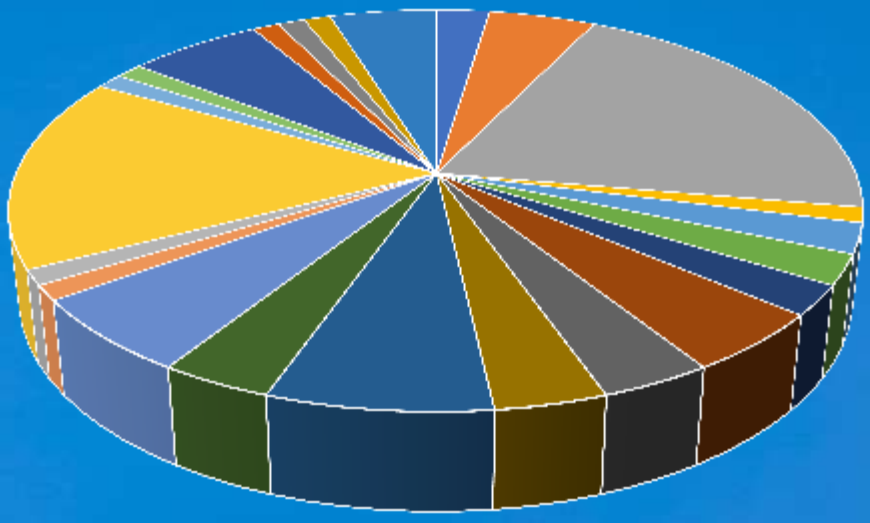
We went on the afternoon safari in a gypsy to the Tadoba Andhari Tiger Reserve. The fauna observed and their corresponding number was recorded as follows.

Serial No.	Common Name	Scientific Name	No. of individuals count
1.	White throated kingfisher	*Halcyon smynenois*	2
2.	Indian Spot billed Duck	*Anas poecilorhyncha*	2
3.	Whistling duck	*Dendrocygna* sp.	17
4.	Green bee eater	*Meros orientalis*	1

Serial No.	Common Name	Scientific Name	No. of individuals count
5.	Black drongo	*Dircurus adsimillis*	3
6.	Little grebe	*Tachybaptus ruficollis*	4
7.	Grey hornbill	*Ocyceros birostris*	2
8.	Yellow footed green pigeon	*Teron phoenicoptera*	2
9.	Red Vented Bulbul	*Pycnontus cafer*	3
10.	Open billed stork	*Anastomus oscitans*	6
11.	Grey Jungle Fowl	*Gallus sonnerattii*	3
12.	Grey Langur	*Semnopithecus sp.*	3
13.	Cotton pygmy goose	*Nettapus coromandelianus*	1
14.	Spotted deer	*Axis axis*	19
15.	Indian roller	*Coracias benghalensis*	3
16.	Indian Gaur	*Bos gaurus*	6
17.	Cattle egret	*Bubulcus ibis*	2
18.	Bronze winged jacana	*Metopidius indicus*	1
19.	Euresian thick knee	*Burhinus oedicnemus*	5
20.	Rufous treepie	*Dendrocitta vagabunda*	1
21.	Black headed ibis	*Pseudibis papillosa*	1
22.	Grey heron	*Ardea cinerea*	1
23.	Red wattled lapwing	*Vanellus indicus*	1
24.	Indian cormorants	*Phalacrocorax fuscicollis*	11
25.	Indian Pea fowl	*Pavo cristatus*	13

Serial no.	Common name	Scientific name	Number of individuals seen
26.	Magpie robin	*Copsyshus saularis*	1
27.	Barking deer	*Muntiacus muntjac*	2
28.	Sambar deer	*Rusa unicolor*	3
29.	Wild boar	*Sus scrofa*	1
30.	Sloth beer	*Melursus ursinus*	5
31.	Tiger cub	*Panthera tigris*	1
32.	Glossy ibis	*Plegadis falcinellus*	1
33.	Rose ring parakeet	*Psittacula krameria*	4
34.	Lesser adjutant stork	*Leptoptilos javanicus*	1

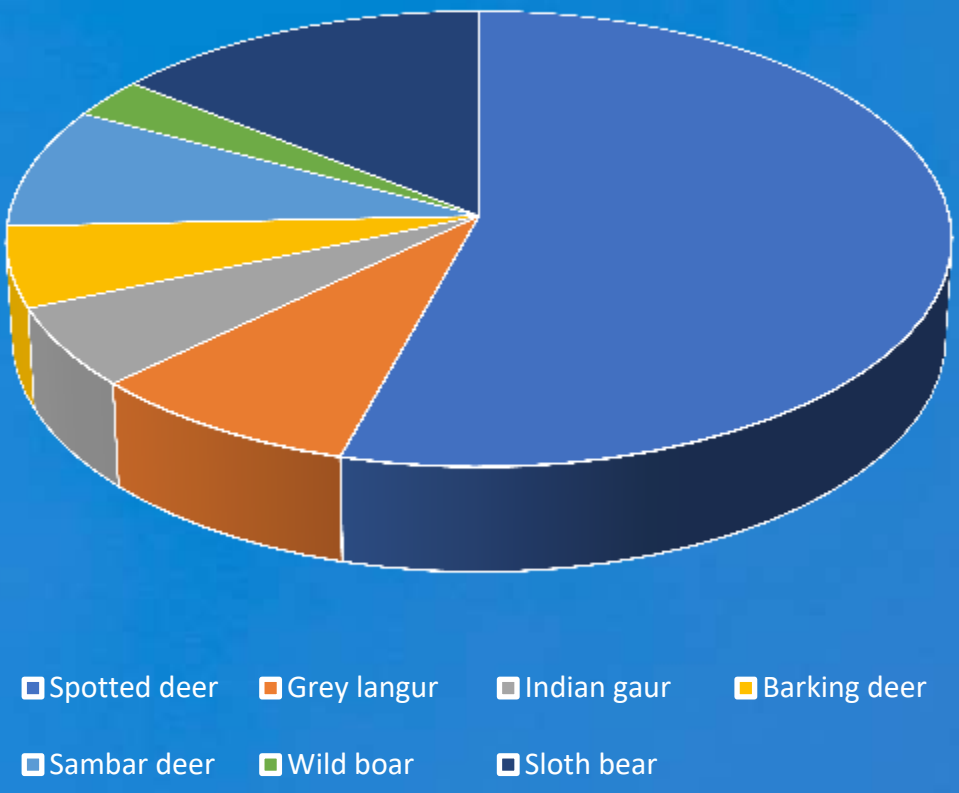
Avian Fauna



- White Throated kingfisher
- Indian Spt billed duck
- Whistling duck
- Green bee eater
- Black drongo
- Grey hornbill
- Yellow footyed green pigeon
- Little grebe
- Red vented bulbul
- Grey Jungle fowl
- Open billed stork
- Indian roller
- Eurasian thick knee
- Rufous treepie
- Black headed ibis
- Indian pea fowl
- Magpie robin

On the basis of the pie chart drawn for Avian fauna we conclude that the dominant species is whistling duct with the individuals of 17.

MAMMALIAN FAUNA



On the basis of the pie chart drawn for Avian fauna we conclude that the dominant species is Spotted deer with the individuals of 19.

3. PITFALL TRAP

❖**Setting the traps:**

- **Date: 24.02.2020**
- **Time: 4:00pm**

❖**Collecting the traps:**

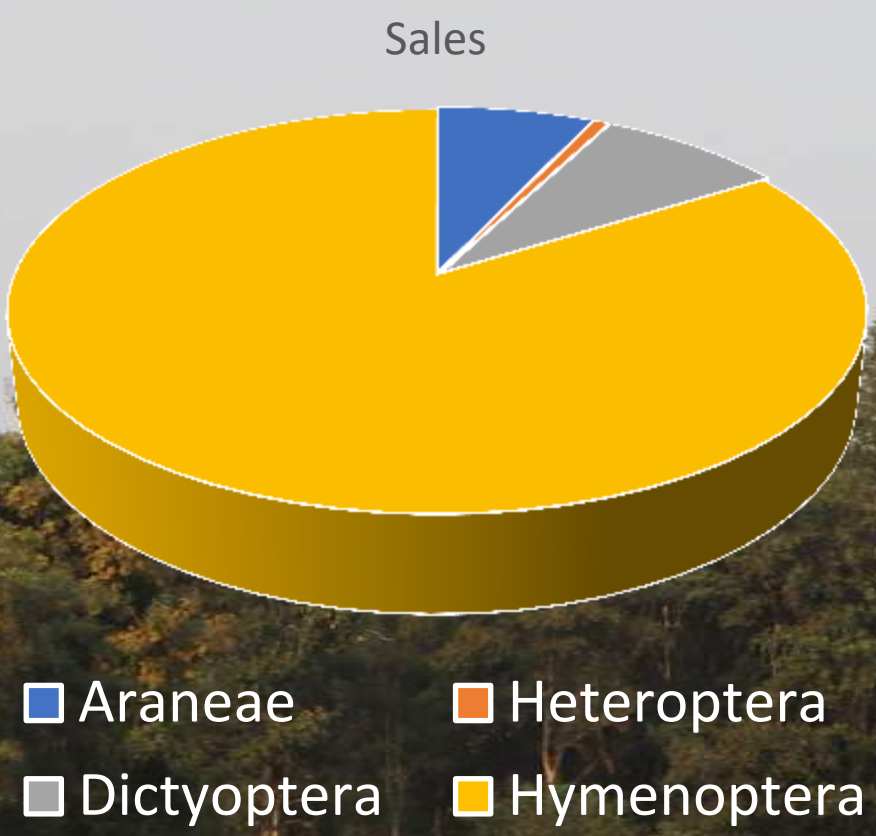
- Date : 26.02.2020
- Time: 7.00am

Making of pitfall traps

The different types of organisms collected in the pit fall trap technique were identified by us under the guidance of our professors and appropriate literature sources. The number of individuals belonging to different insect orders was recorded as follows:

Serial no.	Order	Number of individuals seen
1.	Araneae	10
2.	Heteroptera	10
3.	Dictyoptera	12
4.	Hymenoptera	120

INVERTEBRATE FAUNA



On the basis of the pie chart drawn for Invertebrate fauna we conclude that the dominant species is of order Hymenoptera represented by 120 individuals.

4. QUADRAT STUDY

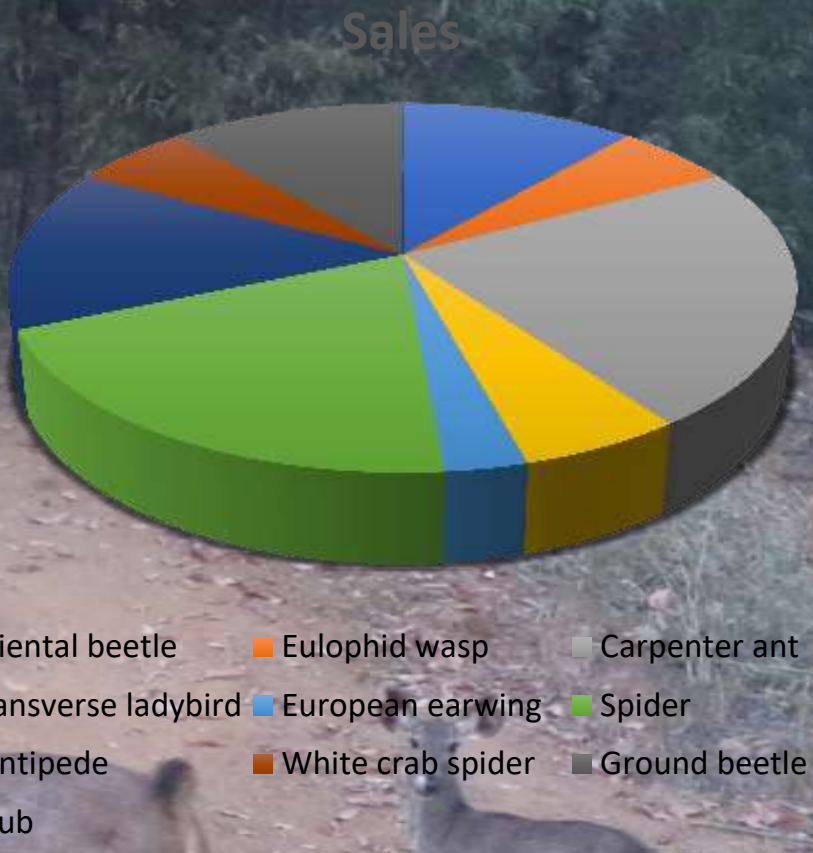
- **Date: 25.02.2020**
- **Time: 11:00am**

Collecting samples from quadrat

We did the quadrat study in Tadoba Andhari Tiger Reserve. The fauna observed and their corresponding number was recorded as follows.

Serial no.	Common name	Scientific name	Number of individuals seen
1.	Oriental beetle	*Anomela sp.*	4
2.	Eulophid wasp	*Chrysocharis sp.*	2
3.	Carpenter ant	*Camponotus sp.*	8
4.	Transverse ladybird	*Coccinella sp.*	2
5.	European earwing	*Forficula Auricularia*	1
6.	Spider(Family: Thomisidae)	*Araneae sp.*	7
7.	Centiped	*Pauropus sp.*	5
8.	White crab spider	*Thomius sp.*	2
9.	Ground beetle	*Calosoma sp.*	4
10.	Grub (larva of beetle)		5

Invertebrate Fauna



On the basis of the pie chart drawn for Invertebrate fauna we conclude that the dominant species is Carpenter ant with the individuals of 8

FAUNA OBSERVED IN SAFARI

Intermediate egret

Indian roller

Asian open billed stork

Black headed ibis

peafowl

Crested serpent eagle

Cotton pygmy goose

White eyed buzzard

Rose ring parakeet

Indian pond heron

Lesser egret

Yellow footed green pigeon

Indian gaur

Tigress

Grey langur

Tigress

Spotted deer

Sambar deer(male and female)

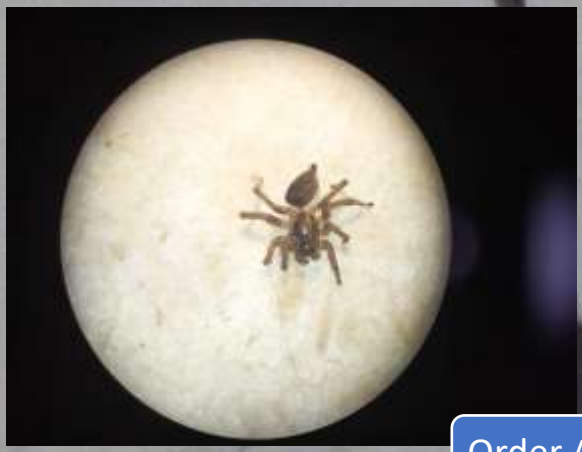
A Sloth bear in search of food

An Indian gaur(male) eating grass

SOME INVERTEBRATE FAUNA OBSERVED

Order Hymenoptera

Order Aranea



Order Arnea

CALCULATION OF THE DIVERSITY INDEX

The data obtained about the distribution of different types of fauna was used to calculate the biodiversity indices.

CALCULATION FOR THE SHANNON WEINER INDEX

The Shannon Weiner index have been calculated for the fauna observed as a whole which means a single table has been prepared for the calculations which includes the animals seen in both morning and afternoon safaris **SAFARI**

AVIAN FAUNA

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
1.	Grey Jungle Fowl	6	0.0379	-3.2728	-0.1240
2.	House Sparrow	1	0.0063	-5.0672	-0.0319
3.	Spotted Dove	3	0.0189	-3.9685	-0.0750
4.	Black Drongo	5	0.0316	-3.4545	-0.1091
5.	Little egret	16	0.1012	-2.2906	-0.2318
6.	Rufous treepie	4	0.0253	-3.6769	-0.0930
7.	Jungle babbler	14	0.0886	-2.4236	-0.2147
8.	Crested serpent eagle	1	0.0063	-5.0672	-0.0319
9.	Red vented bulbul	6	0.0379	-3.2728	-0.1240
10.	Common starling	1	0.0063	-5.0672	-0.0319
11.	Shikra	1	0.0063	-5.0672	-0.0319
12.	Black headed ibis	11	0.0696	-2.6649	-0.1854

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
13.	White throated kingfisher	2	0.0126	-4.3740	-0.0551
14.	Indian spot bill duck	2	0.0126	-4.3740	-0.0551
15.	Green bee eater	1	0.0063	-5.0672	-0.0319
16.	Little grebe	4	0.0253	-3.6769	-0.0930
17.	Open billed stork	6	0.0379	-3.2728	-0.1240
18.	Cotton pygmy goose	1	0.0063	-5.0672	-0.0319
19.	Bronze winged jacana	1	0.0063	-5.0672	-0.0319
20.	Red wattled lapwing	1	0.0063	-5.0672	-0.0319
21.	Grey heron	1	0.0063	-5.0672	-0.0319
22.	Indian cormorants	11	0.0696	-2.6649	-0.1854
23.	whistling duck	26	0.1645	-1.8048	-0.2968

SL no.	Common Name	ni	pi	ln pi	Pi x ln pi
23.	whistling duck	26	0.1645	-1.8048	-0.2968
24.	Lesser adjutant stork	1	0.0063	-5.0672	-0.0319
25.	Grey headed fish eagle	1	0.0063	-5.0672	-0.0319
26.	Glossy ibis	1	0.0063	-5.0672	-0.0319
27.	Yellow footed green pigeon	2	0.0126	-4.3740	-0.0551
28.	Peafowl	15	0.0949	-2.3549	0.2234
29.	Peahen	2	0.0126	-4.3740	-0.0551
30.	Indian roller	3	0.0189	-3.9685	-0.0750
31.	Magpie robin	1	0.0063	-5.0672	-0.0319
32.	Euresian thick knee	5	0.0316	-3.4545	-0.1091
33.	Grey hornbill	2	0.0126	-4.3740	-0.0551
	TOTAL	158			-3.2507

Here ∑pi x ln pi =-3.2507
Therefore, Shannon Weiner Index =-(-3.2507)=3.2507
Species Evennness, J= 3.2507/ln 33=0.9296

MAMMALIAN FAUNA

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
1.	Spotted deer	36	0.4285	-0.8474	-0.3631
2.	Indian gaur	29	0.3452	-1.0636	-0.3671
3.	Tiger	4	0.0476	-3.0449	-0.1451
4.	Grey langur	4	0.0476	-3.0499	-0.1451
5.	Sloth bear	5	0.0595	-2.8217	-0.1678
6.	Barking deer	2	0.0238	-3.7380	-0.0889
7.	Sambar deer	3	0.0357	-3.3326	-0.1189
8.	Wild boar	1	0.0119	-4.4312	0.0527
	TOTAL	84			

Here ∑pi x ln pi =-1.4487
Therefore, Shannon Weiner Index =-(-1.4487)=1.4487
Species Evennness, J= 1.4487/ln 8=0.6966

Since the value of Shannon Weiner index is directly proportional to uncertainty we can predict that the uncertainty in the distribution of Avian fauna(having a higher value of 3.2507) is more than that of Mammalian ones(having lower value of 1.4487). However on the basis of values of species Evenness we can predict that Birds have more even distribution in ecosystem in comparision to Mammalian fauna.

PITFALL TRAP

INVERTEBRATE FAUNA

Serial no.	Order	ni	pi	ln pi	Pi x ln pi
1.	Araneae	10	0.0699	-2.6607	-0.1860
2.	Heteroptera	1	0.0070	-4.9618	-0.0347
3.	Dictyoptera	12	0.0839	-2.4781	-0.2079
4.	Hymenoptera	120	0.8392	-0.1753	-0.1471
	TOTAL	143			-0.5757

Here ∑pi x ln pi =-0.5757
Therefore, Shannon Weiner Index =-(-0.5757)=0.5757
Species Evenness, J= 0.5757/ln 4=0.4153

Since the value of Shannon Weiner Index is directly proportional to uncertainty, we can predict that the uncertainty in the distribution of orders of organisms collected in pit fall trap is of lower value index i.e. 0.5757. We can also predict that Arthropod orders have an even distribution.

QUADRAT

INVERTEBRATE FAUNA

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
1.	Oriental beetle	4	0.1	-2.3025	-0.2302
2.	Eulophid wasp	2	0.005	-2.9957	-0.1497
3.	Carpenter ant	8	0.2	-1.6094	-0.3218
4.	Transverse ladybird	2	0.05	-2.9957	-0.1497
5.	European earwing	1	0.025	-3.6888	-0.0922
6.	Spider(Family: Thomisidae)	7	0.175	-1.7429	-0.3050
7.	Centiped	5	0.125	-2.0794	-0.2599
8.	White crab spider	2	0.05	-2.9957	-0.1497
9.	Ground beetle	4	0.1	-2.3025	-0.2302
10.	Grub (larva of beetle)	5	0.125	-2.0794	-0.2599
	TOTAL	40			-2.1483

Here ∑pi x ln pi =-2.1483
Therefore, Shannon Weiner Index =-(-2.1483)=2.1483
Species Evenness, J= 2.1483/ln 10=0.9330

Since the value of Shannon Weiner index is directly proportional to uncertainty we can predict that the uncertainty in the distribution of Invertebrate fauna was found to of higher value of 2.1483. However, the species evenness was found to have a higher value of 0.9330, so we can say that the invertebrate species are evenly distributed in the ecosystem.

BOR TIGER RESERVE

Date of arrival: 26.02.2020
Time of arrival: 1:00pm

Events : 1.Morning safari
2.Afternoon safari

Date of departure: 28.02.2020
time of departure: 6:00am

To the wilderness

Picture clicked before going to morning safari

HIGHLIGHTS

- **Bor Tiger Reserve is situated in the core area. It is the sixth tiger reserve of Maharashtra and smallest tiger reserve in India.**
- **February to may is the best time to visit.**
- **seasons:**
  - **summer (February to July with the temperature of 30-47°C)**
  - **Monsoon (Mid June to October)**
  - **winter (November to January with minimum temperature of 9°C)**
- **Best time to visit in April to May.**
- **Water resources: Bor dam**

LOCATION

Bor Tiger Reserve is centrally located among several other Bengal tiger habitats including: Pench Tiger Reserve, Maharashtra, 90 km2 (35 sq mi) to the northeast; Nagzira Navegaon Tiger Reserve, 125 km2 (48 sq mi) to the east northeast; Umred Karhandla Wildlife Sanctuary, 75 km2 (29 sq mi) to the east southeast; Tadoba - Andhari Tiger Reserve, 85 km2 (33 sq mi) to the southeast; Melghat Tiger Reserve, 140 km2 (54 sq mi) to the west northwest and Satpura National Park and Tiger Reserve,160 km2 (62 sq mi) to the northwest.

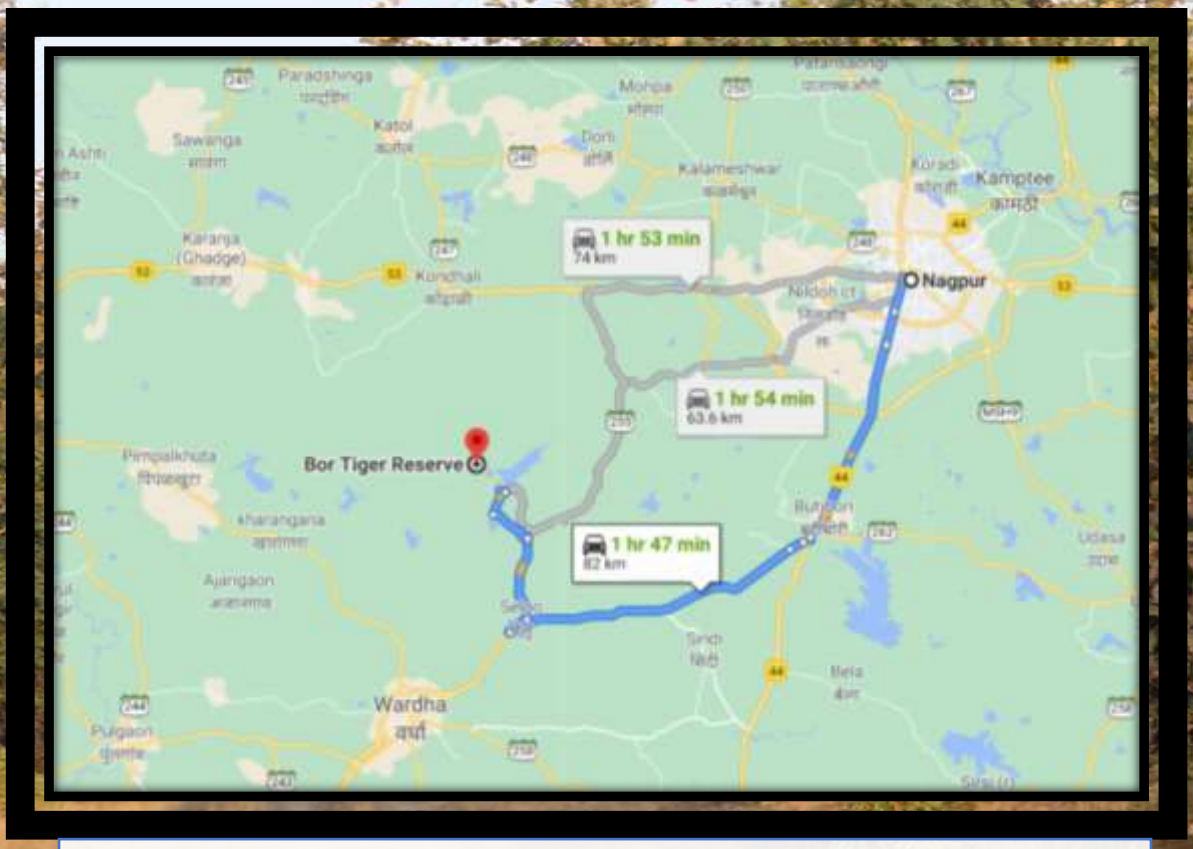
HOW TO REACH TO BOR

- To reach the Bor Tiger Reserve, one must go ahead on the Wardha-Nagpur road through MSH3 and turn North at Seloo for Hingni. From Hingni you can directly reach the visitor center at Bor Dam.

- By Air: Dr Babasaheb Ambedkar International Airport in Nagpur is closest to Bor Tiger Reserve. It is 80 km away from the sanctuary.

- By Railways: The nearest railhead, Wardha, is about 35 km away.

- By Road: The Hingni bus stand is at merely 5 km from the sanctuary. Buses arrive from and depart to Bor Wildlife Sanctuary frequently here.



Road map from Nagpur city to Bor Tiger Reserve

ZONES

- In April, 2012, the Maharashtra state government issued a notification adding 60 km2 (23 sq mi) to the old 61.1 km2 (23.6 sq mi) area of Bor Sanctuary. The new Core Zone of 115.92 km2 (44.76 sq mi) is the most protected and inviolate part of the sanctuary where the public is not allowed. It comprises 95.7% of the total area. Most of the core area is contiguous with good forest of Wardha Forest Division and Nagpur Forest Division.

- The Eco-tourism Zone of 5.21 km2 (2.01 sq mi) designated for public access for nature and wildlife tourism comprises 4.3% of the total sanctuary area. The purpose of the tourism zone is to educate the public about the significance of nature and wildlife conservation and to stimulate their environmental awareness.

- The Buffer Zone is less protected forest area near the sanctuary that serves as a protective barrier for the core area.

- The Bor Tiger Reserve is physically divided by the Bor Reservoir into 2 sections, previously; 2/3 (40 km2 (15 sq mi)), as the west part and 1/3 (21 km2 (8.1 sq mi)), as the eastern part. 95% of the western part is in Wardha district and 90% of the eastern part is in Nagpur district. The Bor Reservoir area is about 7.25 km2 (2.80 sq mi) and is not included in the total sanctuary area.

PICTURE OF ECOSYSTEMS

FOREST ECOSYSTEM

Site 1

Site 2

GRASSLAND ECOSYSTEM

Site 1

Site 2

AQUATIC ECOSYSTEM

Site 1

Site 2

ENVIRONMENTAL ANALYSIS

➢MEASUREMENT OF AIR TEMPERATURE:

Date : 27.02.2020
Temperature at 5:30 am: 17.2◦C
Temperature at 7.40 pm: 26.5◦C

➢MEASUREMENT OF PH OF SOIL SAMPLE:

The soil collected from the area where we stayed at night and the PH sample was analysed
Date of measurement: 27.02.2020
PH value: 7.8

➢ COMMENTS:

Temperature are found to be moderate. The soil of the forested area was found to be alkaline. This indicates that the area has mostly clay soil with poor structure and low infiltration capacity. The soil has a low concentration of micronutrients.

FLORA OF BOR TIGER RESERVE

The Bor Tiger Reserve is populated by Dry Deciduous Forest type. Teak, Tikur, Bamboo, Tarot, Gokhru are some of the abundant species.

ZOOLOGICAL DIVERSITY

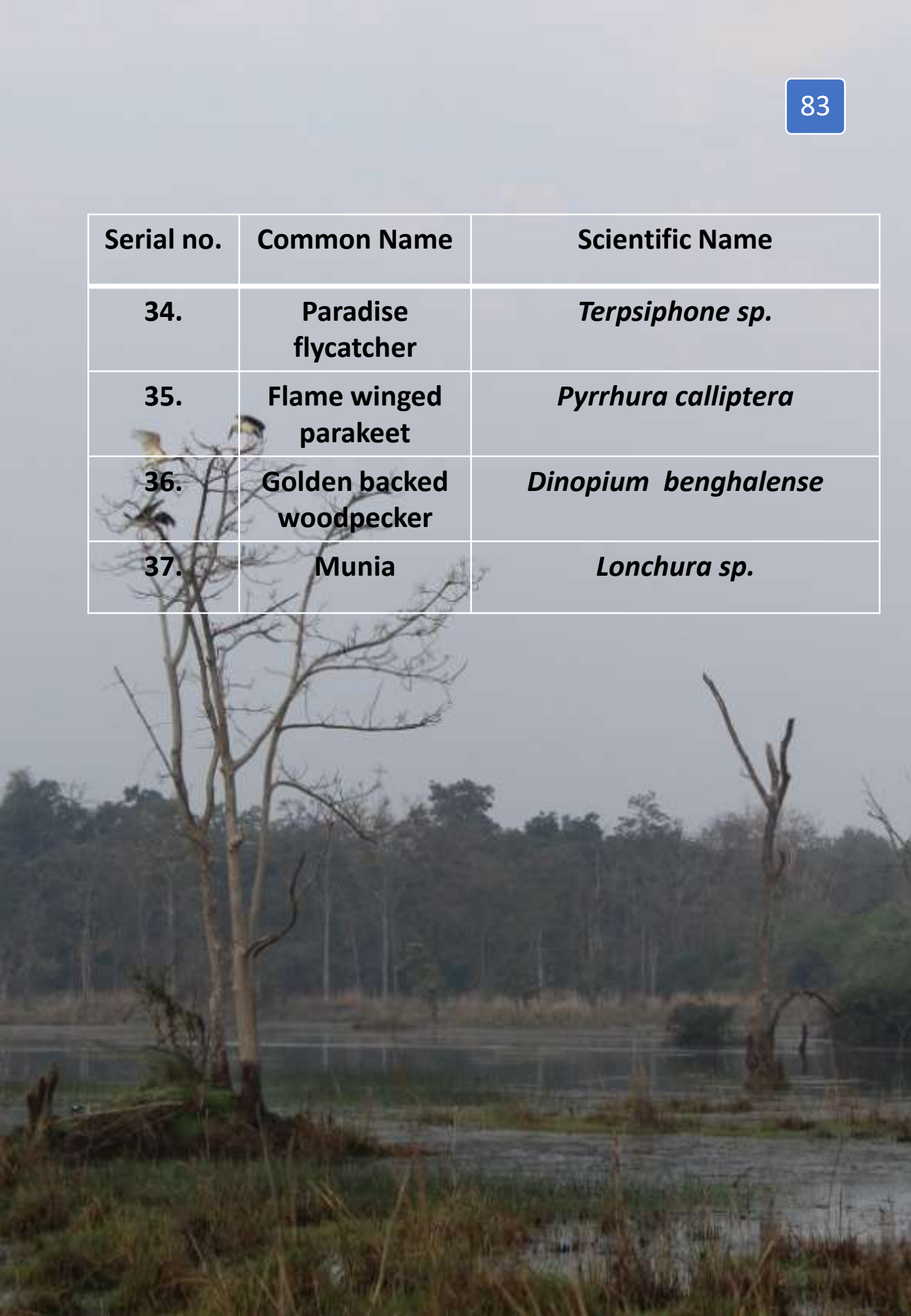
- The Tadoba Andhari Tiger Reserve is very rich in faunal diversity. Among the many kinds of organisms found in Tadoba some are listed below as follows.

BIRDS

SL no.	Common Name	Scientific Name
1.	Grey Jungle Fowl	*Gallus sonneratii*
2.	House Sparrow	*Passer domesticus*
3.	Spotted Dove	*Spilopelia chinensis*
4.	Black Drongo	*Dircurus macrocercus*
5.	Little egret	*Egretta garzetta*
6.	Rufous treepie	*Dendrocitta vagabunda*
7.	Jungle babbler	*Turdoides striata*
8.	Crested serpent eagle	*Spilornis cheela*
9.	Red vented bulbul	*Pycnonotus cafer*
10.	Common starling	*Sturnus vulgaris*
11.	Shikra	*Accipiter badius*
12.	Black headed ibis	*Threskiornis melanocephalus*

Serial no.	Common Name	Scientific Name
13.	White throated kingfisher	*Halcyon smyrnensis*
14.	Indian spot bill duck	*Anas poecilorhyncha*
15.	Green bee eater	*Merops orientalis*
16.	Little grebe	*Tachybaptus ruficollis*
17.	Open billed stork	*Anastomus oscitans*
18.	Cotton pygmy goose	*Nattapus coromandelianus*
19.	Bronze winged jacana	*Metopidius indicus*
20.	Red wattled lapwing	*Vanellus indicus*
21.	Grey heron	*Ardea cinerea*
22.	Indian cormorants	*Phalacrocorax fuscicollis*
23.	whistling duck	*Dendrocygna sp.*
24.	Lesser adjutant stork	*Leptoptilos javanicus*
25.	Grey headed fish eagle	*Ichthyophaga ichthyaetus*
26.	Glossy ibis	*Plegadis falcinellus*
27.	Yellow footed green pigeon	*Treron phoenicoptera*
28.	Peafowl	*Pavo cristatus*
29.	Peahen	*Pavo cristatus*
30.	Indian roller	*Curacias benghalensis*
31.	Magpie robin	*Copsychus saularis*
32.	Euresian thick knee	*Burhinus oedicnemus*
33.	Grey hornbill	*Ocyceros birostris*

Serial no.	Common Name	Scientific Name
34.	Paradise flycatcher	*Terpsiphone sp.*
35.	Flame winged parakeet	*Pyrrhura calliptera*
36.	Golden backed woodpecker	*Dinopium benghalense*
37.	Munia	*Lonchura sp.*



MAMMALS

Serial no.	Common Name	Scientific Name
1.	Spotted deer	*Axis axis*
2.	Indian gaur	*Bos gaurus*
3.	Grey langur	*Semnopithecus sp.*
4.	Sloth bear	*Melursus ursinus*
5.	Tiger	*Panthera tigris*
6.	Wolf	*Canis lupus*
7.	Jackal	*Canis aureus*
8.	Wild dog	*Cuon alpines*
9.	Fox	*Vulpes sp.*
10.	Hyena	*Hyaena hyaena*
11.	Sambar deer	*Rusa unicolor*
12.	Wild boar	*Sus scrofa*
13.	Blue bull	*Boselaphus tragocamelus*
14.	Porcupine	*Hystrx indica*
15.	Rhesus macaque	*Macaca mulatta*
16.	Leopard	*Panthera pardus*
17.	Jungle cat	*Felis chaus*
18.	Rusty spotted cat	*Prionilurus rubiginiosus*
19.	Indian pangolin	*Manis sp.*
20.	Four horned antelope	*Tetracerus quadricornis*
21.	Barking deer	*Muntiacus muntjak*

JUNGLE SAFARIES FOR BIODIVERSITY ASSESSMENT

We did two jungle safaris in Bor Tiger Reserve in order to have a clear idea of its bio diversity. We went for the first safari on the morning of 27th February,2020 which started at 7:00 am and ended at 10:00 am.

We went for the second safari in the afternoon of 27th February,2020 which started at 2:00 pm and ended at 5:30 pm.

The data collected from all these activities has been presented in the next pages in the form of a census report.

A group picture taken just outside the entry gate

1. MORNING SAFARI

- **Date :27.02.2020**
- **Zone : Bordharan zone**
- **Started at: 7:00 am**
- **Ended at: 10:00 am**

Pictures taken during the morning safari

We went on the morning safari in a gypsy to the Bor Tiger reserve. The fauna observed and their corresponding number was recorded as follows.

Serial number	Common Name	Scientific Name	Number of individual seen
1.	Spotted deer	*Axis axis*	23
2.	Grey jungle fowl	*Gallus sonneratii*	4
3.	Munia	*Lonchura sp.*	2
4.	Blue bull	*Boselaphus tragocamelus*	1

Serial no.	Common Name	Scientific Name	Number of individuals seen
5.	Sotted dove	*Spilopelia chinensis*	1
6.	Black drongo	*Dircurus adsimillis*	2
7.	Rose ring parakeet	*Psittacula krameri*	4
8.	Indian roller	*Coracias benghalensis*	6
9.	Jungle babbler	*Turdoides striata*	4
10.	Crested serpent eagle	*Spilonnis cheela*	1
11.	Indian pond heron	*Ardeola grayii*	2
12.	Indian cormorants	*Phalacrocorax carbo*	1
13.	Peacock	*Pavo cristatus*	12
14.	Grey langur	*Semnopithecus sp.*	14
15.	Green bee eater	*Merops orientalis*	1
16.	Grey heron	*Ardea cinera*	1
17.	White eyed buzzard	*Butastur teesa*	1
18.	Yellow footed green pigeon	*Ternon sp.*	4
19.	Sambar deer	*Rusa unicolor*	37

2. AFTERNOON SAFARI

- **Date:27th February 2020**
- **Zone: Bordharan zone**
- **Started at: 2:00pm**
- **Ended at: 5:30pm**

picture of us clicked during Afternoon safari

Picture taken before entering the Bordharan zone

We went on the afternoon safari in a gypsy to the Bor Tiger Reserve. The fauna observed and their corresponding number was recorded as follows.

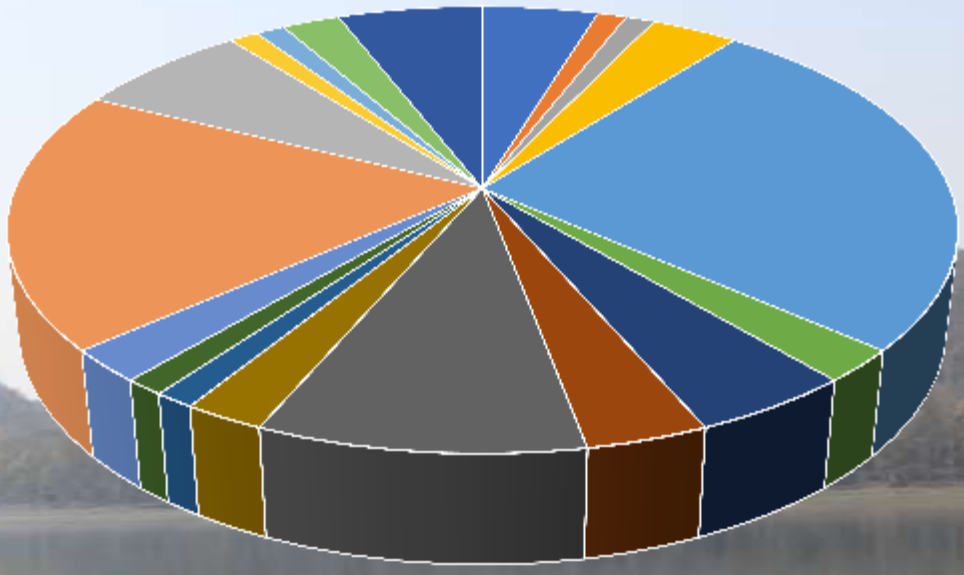
Serial No.	Common Name	Scientific Name	No. of individuals count
1.	Rose ring parakeet	*Psitacula krameri*	12
2.	Blue bull	*Boselaphus tragocamelus*	5
3.	Crested serpent eagle	*Spilornis cheela*	2
4.	Green bee eater	*Meros orientalis*	1

Serial No.	Common Name	Scientific Name	No. of individuals count
5.	Black drongo	*Dircurus adsimillis*	1
6.	Sambar deer	*Rusa unicolor*	20
7.	Wild boar	*Sus scrota*	1
8.	Yellow footed green pigeon	*Teron phoenicoptera*	4
9.	Golden back woodpecker	*Dinopium bhenghalense*	1
10.	Flame winged parakeet	*Pyrrhura calliptera*	1
11.	Grey Langur	*Semnopithecus sp.*	13
12.	Spotted deer	*Axis axis*	16
13.	Red wattled lapwing	*Vanellus indicus*	2
14.	Indian Pea hen	*Pavo cristatus*	5
15.	Indian pea fowl	*Pavo cristatus*	10

CHART REPRESENTATION OF BIODIVERSITY

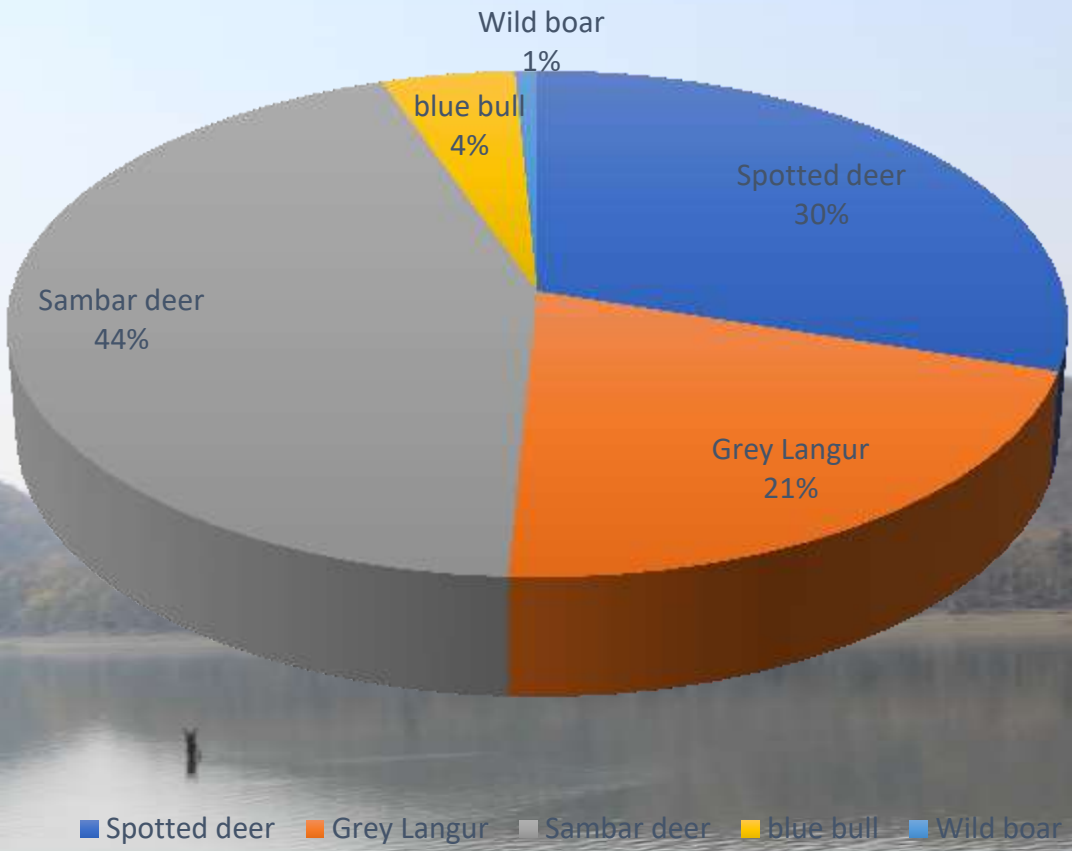
Based on the above data the fauna observed has been ststistically representated as under:

Avian Fauna



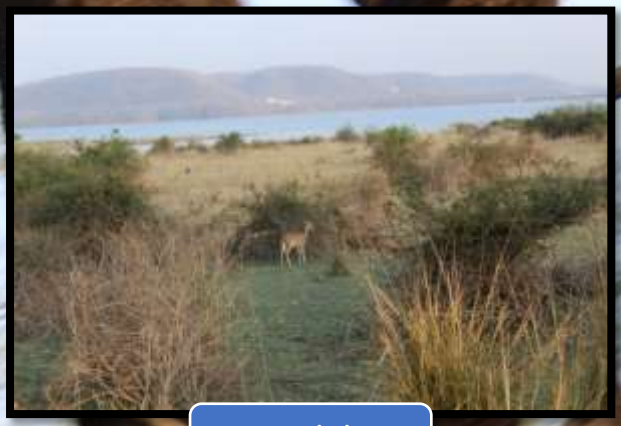
On the basis of the Pie chart drawn for avian fauna we conclude that the dominant species is Peacock with 22 individuals.

Mammalian Fauna



On the basis of the Pie Chart drawn for mammalian fauna we conclude that the dominant species is Sambar deer represented by 37 individuals.

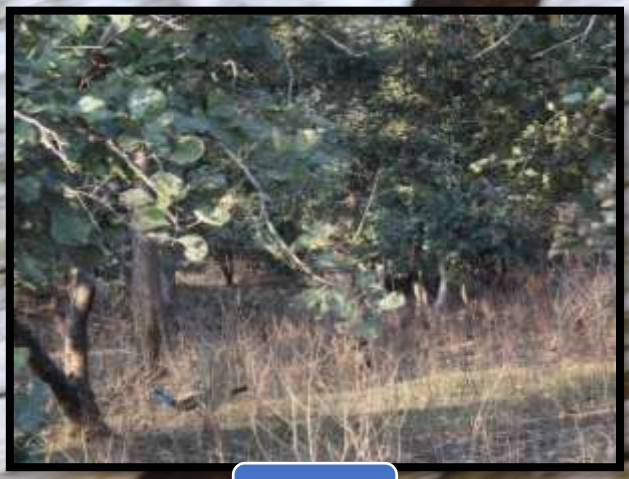
FAUNA OBSERVED IN SAFARI



Spotted deer

Sambar deer

Yellow footed green pigeon



peafowl

Sambar deer

Indian roller

CALCULATION OF THE DIVERSITY INDEX

The data obtained about the distribution of different types of fauna was used to calculate the biodiversity indices.

CALCULATION FOR THE SHANNON WEINER INDEX

The Shannon Weiner index have been calculated for the fauna observed as a whole which means a single table has been prepared for the calculations which includes the animals seen in both morning and afternoon safaris

SAFARI

AVIAN FAUNA

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
1.	Grey Jungle Fowl	4	0.0470	-3.0576	-0.1437
2.	Munia	2	0.0235	-3.7507	-0.0881
3.	Yellow footed green pigeon	8	0.0941	-2.3633	-0.2223
4.	Black Drongo	3	0.0352	-3.3467	-0.1178
5.	Rose ringed parakeet	16	0.1882	-1.6702	-0.3143
6.	Indian roller	6	0.0705	-2.6521	-0.1869
7.	Jungle babbler	4	0.0470	-3.0576	-0.1437
8.	Crested serpent eagle	3	0.0352	-3.3467	-0.1178
9.	Indian pond heron	2	0.0235	-3.7507	-0.0881

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
10.	Peafowl	22	0.2588	-1.3516	-0.3497
11.	Indian cormorant	1	0.0117	-4.4481	-0.0520
12.	Green bee eater	2	0.0235	-3.7507	-0.0881
13.	Grey heron	1	0.0117	-4.4481	-0.0520
14.	White eyes buzzard	1	0.0117	-4.4481	-0.0520
15.	Golden backed woodpecker	1	0.0177	-4.4481	-0.0520
16.	Flame winged parakeet	1	0.0177	-4.4481	-0.0520
17.	Red wattled lapwing	2	0.0235	-3.7507	-0.0881
18.	Peahen	5	0.0588	-2.8336	-0.1666
19.	Spotted dove	1	0.0177	-4.4481	-0.0520
	TOTAL	85			-2.8952

Here $\sum$pi x ln pi =-2.8952
Therefore, Shannon Weiner Index =- (-2.8952)=2.8952
Species Evenness, J= 2.8952/ln 19=0.9832

MAMMALIAN FAUNA

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
1.	Spotted deer	39	0.3	-1.2039	-0.3611
2.	Grey langur	27	0.2076	-3.8747	-0.8043
3.	Blue bull	6	0.0461	-3.0769	-0.1418
4.	Sambar deer	57	0.4384	-0.8246	-0.3636
5.	Wild boar	1	0.0076	-4.8796	-0.0370
	TOTAL	130			-1.6772

Here ∑pi x ln pi =-1.6772
Therefore, Shannon Weiner Index =- (-1.6772)=1.6772
Species Evenness, J=1.6772 /ln 5=1.0421

Since the value of Shannon Weiner index is directly proportional to uncertainty we can predict that the uncertainty in the distribution of Avian fauna(having a higher value of 2.8952) is more than that of Mammalian ones(having lower value of 1.6772). However on the basis of values of species Evenness we can predict that Mammals have more even distribution in ecosystem in comparison to Avian fauna

MAN-WILDLIFE CONFLICT

Human-Wildlife Conflict refers to the interaction between wild animals and people and the resultant negative impact on people or their resources, or wild animals or their habitat. It occurs when growing human populations overlap with established wildlife territory, creating reduction of resources or life to some people and/or wild animals. The conflict takes many forms ranging from loss of life or injury to humans, and animals both wild and domesticated, to competition for scarce resources to loss and degradation of habitat.

OUTCOMES OF CONFLICT

Human-Wildlife conflict occurs with various negative results. The major outcomes of human-wildlife conflict are:

- ❖ Injury and loss of life of humans and wildlife.
- ❖ Crop damage, livestock and depredation, predation of managed wildlife stock.
- ❖ Damage to human property.
- ❖ Trophic cascades.
- ❖ Destruction of habitat.
- ❖ Collapse of wildlife populations and reduction of geographic ranges.

One of the initiators of the concept of man-animal conflict was Das and Guha. They described the two-sided impacts of this conflict. From one side, the source of conflict is the restriction on the local people to access forest resources. On the other side, the source of conflict is the damage incurred to them by wild animals.

SOLUTIONS FOR MAN-WILDLIFE CONFLICT

The solutions are often specific to the species or area concerned, and are often creative and simple.

An important aspect of the work is that it benefits both the animals and local human communities, and actively involves these communities. This is about finding solutions that lead to mutually beneficial co-existence.

The work has also often led to people being more enthusiastic and supportive of conservation, and has demonstrated that people can live alongside wildlife while developing sustainable livelihoods.

These include:

❖ A UNITED EFFORT

In order to be truly effective, prevention of human-wildlife conflict has to involve the full scope of society : International organizations, governments, NGOs communities, communities, consumers and individuals. Solutions are possible, but often they also need to have financial backing for their support and development.

❖ LAND-USE PLANNING

Ensuring that both humans and animals have the space they need is possible. Protecting key areas for wildlife, creating buffer zones and investing in alternative land uses are some of the solutions.

❖COMMUNITY-BASED NATURAL RESOURCE MANAGEMENT

The local community is key since they are the ones who may wake up in the morning with a tiger or bear in their backyard. But they are also the people who can benefit the most from this. If people are empowered to manage their relationship with wild animals, these “unwanted” neighbors can become allies in bringing income and promoting a better quality of life for all.

❖ COMPENSATION/ INSURANCE

Compensation or insurance for animal-induced damage is another widely accepted solution. There are different ways this can be done. In Tadoba, for example, community-based insurance system exists for damage done to livestock. The Indian government pays compensation in areas around the national park.

❖ PAYMENT FOR ENVIRONMENTAL SERVICES

Payment for Environmental Services (PES) is a concept that has recently gained popularity in the international development and conservation community. The most popular of these is financial reward for the sequestering of carbon, but it is also seen as a potential solution for human-wildlife conflict.

❖ WILDLIFE FRIENDLY PRODUCTS

Consumers is distant countries also have a role to play. Always look for products that are environmentally friendly and recognized by serious organizations.

❖ FIELD BASED SOLUTIONS

There are a number of practical field-based solutions that can limit the damage done both to humans and human property, and to wildlife, by preventing wildlife from entering the fields or villages. However, such solutions can only be applied on a case-by-case basis. What people see as solution in one place, they may resist in another. And what works in one place, may have the opposite effect somewhere else.

CASE STUDY IN TADOBA-1

- Name: Roshan Jengtha
- Age: 25 years old
- Village: Junona village
- Residence : Permanent residence
- Work: Work as a house keeper in the resort where we stayed in Tadoba
- Distance between home and forest: 1km from Junona zone
- Literacy: 1 member only (graduation, 1st year)
- Family: 4 members
- Expenditure: In house only
- Tresspassing animals: Spotted deer, Jackal, Tiger, Leopard.
- Agriculture: Rice
- Medicinal plant: Nil
- Working man in the family: 2 members
- Principle occupation: Resort workers
- Annual family income: 30,000 /-
- Number of Human wildlife conflict seen by him: Nil
- Government help: Insufficient

CASE STUDY IN TADOBA-2

- Name: Rakesh Wadai
- Age: 29 years old
- Village: Adilbashi gaon
- Residence : permanent residence
- Work: Forest guide
- Distance between home and forest: 10Km from Junona zone
- Literacy: 4 members (12^{th} pass)
- Family: 5 members
- Expenditure: in House and education
- Tresspassing animals: Spotted deer, Wild boar.
- Agriculture: Nil
- Medicinal plant: Neem, Tulsi, Haldi.
- Working man in the family: 3 members
- Principle occupation: Forest guide
- Family annual income: 30,000/-
- Number of Human wildlife conflict seen by him: 2
- Government help: Insufficient

Picture of us, taking interviews in Tadoba

CASE STUDY IN BOR -1

- Name: Dilip Jogi
- Age: 26 years old
- Village: Bordharan village
- Residence : Permanent residence
- Work: Gypsy Driver
- Distance between home and forest: 1km from Bordharan zone
- Literacy: 1 member only(12th pass)
- Family: 4 members
- Expenditure: in house only
- Tresspassing animals: Spotted deer, Sambar deer, Tiger, Nilgai, Leopard.
- Agriculture: Rice
- Medicinal plant: Neem, Tulsi, Wood-apple
- Working man in the family: 2 members
- Principle occupation: Gypsy driver, Farming
- Family annual income: 84,000/-
- Number of Human wildlife conflict seen by him: Nil
- Government help: Insufficient

CASE STUDY IN BOR -2

- Name: Manjesh Wardey
- Age: 38 years old
- Village: Bordharan village
- Residence : permanent residence
- Work: Hotel manager of one of the resorts in Bordharan
- Distance between home and forest: 1km from Bordharan zone
- Literacy: 1 member only (graduated)
- Family: 5 members
- Expenditure: in house only
- Tresspassing animals: Peacock, Sambar, Leopard
- Agriculture: Nil
- Medicinal plant: Neem, Tulsi
- Working man in the family: 1 Member only
- Principle occupation: Hotel management
- Family annual income: 90,000/-
- Number of Human wildlife conflict seen by him: 2
- Government help: Insufficient

Picture of us, taking interviews in Bor

CONCLUSION

The Gaia Hypothesis proposes that *living organisms interact with their inorganic surroundings on Earth to form a synergistic and self-regulating, complex system that helps to maintain and perpetuate the conditions for life on this planet.* (Lovelock, 1979)

Thus, the conservation of biodiversity is essential for our own survival on this planet. Biodiversity provides us with huge ecosystem services like the maintenance of the air composition and purity, formation and replenishment of soil, pollination of crops, etc.

The studying and inventorying of biodiversity of any particular area is the first step towards

❖ Identification of potential bio resources, which could be of direct use to mankind, as well as

❖ Application of conservation measures and targeting of conservation resources. Due to the limited amount of conservation resources available, it becomes necessary to target them at proper sites. Studying biodiversity helps us to identify the sites and levels where we should apply our conservation measures.

EXCURSION DISCUSSION ON THE LAST DAY OF OUR EDUCATIONAL EXCURSION TRIP AROUND A CAMP FIRE

ACKNOWLEDGEMENT

I take the opportunity to express my profound gratitude and deep regards to our professors, Prof. Swagata Chattopadhyay, Dr. Aniruddha Chatterjee and for their exemplary guidance, monitoring and constant encouragement throughout the course of this educational project. The help and guidance given by her from time to time shall carry me a long way in the long run.

I also take the opportunity to express a deep sense of gratitude to the forest officials for their care, guidance, support and help without which completing this project wouldn't have been easy.

I am also obliged to thank our principal, Dr. Arpita Mukherjee, Dr, Narayan Chandra Das for making it possible for us to go for this trip. I am thankful to the supportive staffs of the Zoology department whose assistance in the laboratory has been of immense help to this project.

Signature of the student

Abhik Rong

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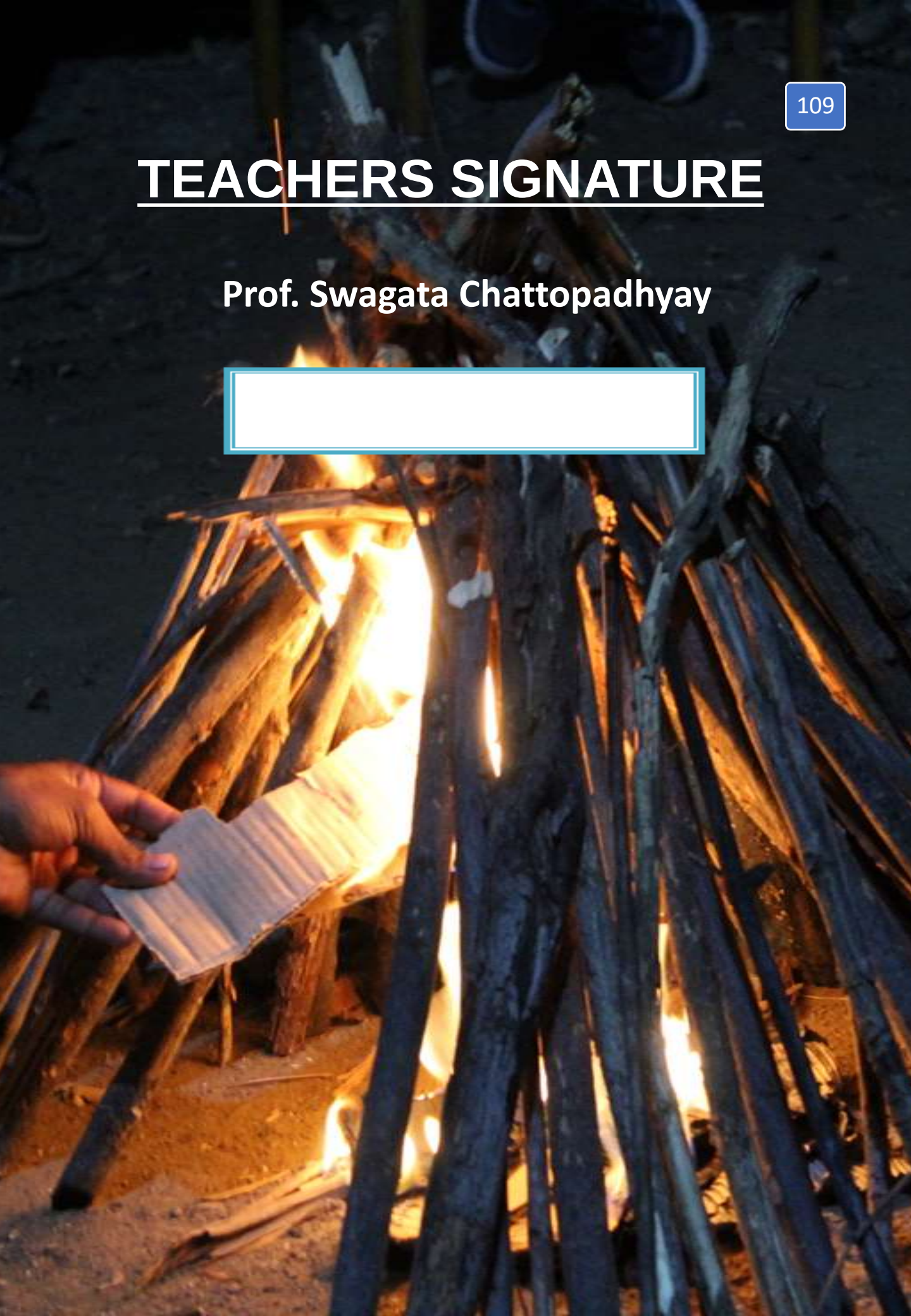
TEACHERS SIGNATURE

Prof. Swagata Chattopadhyay



University of Calcutta

Excursion to Tadoba-andhari Tiger Reserve

Anuska Dutta ; CU Roll No: 183223-11-0104

Registration No: 223-1211-0391-18

Subject : zooA **paper:** CC11, **Roll** : 18S-734

Content

Introduction

Aim of Excursion

The purpose of zoological excursion is to gain a much deeper knowledge about the topics related to the subjects such as wildlife, nature & environment with the help of practical demonstrations along with theoretical facts. Whole their purpose is essentially to educate, they can also be fun bonding experience for everyone involved. Moreover without practical knowledge the study wildlife & observe animals & their behavior in their natural habitat.

Hence zoological excursion helps us to come in close contact with the flora & fauna of various places with different climatic conditions & atmospheric variations & better understanding of the relation between flora & fauna.

Some of the important advantage of excursions is as under:- (i)They provide direct source of

knowledge and acquaint the student with first hand information.

(ii) They provide an opportunity to the student for develop-ment of his aesthetic sense.

(iii) By such excursion students become interested in the explo-ration of their environment.

(iv) They help to develop in students a love for nature and to acquaint them with the real happiness in the outside world.

(v) It helps in development of power of observations, explora-tion, judgment and drawing inferences, problem solving ability of students.

(vi) It helps in developing qualities of resourcefulness, self- confidence, initiative and leadership amongst students.

vii) It helps in developing cooperative attitude and various others

(viii) It helps in proper utilization of leisure.

(ix) It motivates the students for self-study and self-activity.

(x) It helps in the development of creative faculties of the students.

Purpose of field notes:-

Field research, field studies, or fieldwork is the collection of raw data outside a laboratory, library, or workplace setting. The approaches and methods used in field research vary across disciplines. For example, biologists who conduct field research may simply observe animals interacting with their environments, whereas social scientists conducting field research may interview or observe people in their natural environments to learn their languages, folklore, and social structures.

Field research involves a range of well-defined, although variable, methods: informal interviews, direct observation, participation in the life of the group, collective discussions, analyses of personal documents produced within the group, self-analysis, results from activities undertaken off- or on-line, and life-histories. Although the method generally is characterized as qualitative research, it may (and often does) include quantitative dimension.

Biodiversity: The key of Diversity : - All aspects of diversity of flora & fauna but specially the richness of species within a specified region or the world the complexity of ecosystem and genetic diversity. Biodiversity refers to the variety of living species on Earth, including plants, animals, bacteria, and fungi. While Earth's biodiversity is so rich that many species have yet to be discovered, many species are being

threatened with extinction due to human activities, putting the Earth's magnificent biodiversity at risk.

Biodiversity is the degree of variations of life. It can refer to genetic variations, species variation or ecosystem variation within an area biome or planat. Terrestrial biodiversity tends to be the highest at low latitudes near the equator, which seems to be the result of warm climate & high primary productivity.

Marine biodiversity tends to be highest along coasts in western pacific when sea surface temperature is highest & the mid-latitudinal band in all oceans. Biodiversity generally tends to clusters in hotspots & has been increasing through time but will be likely to show in the future. Rapid environment changes typically cause mass extinctions.

Our excursion dairy

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE

Date of Journey :- 23rd February 2020
Train No & Name :- 12860 Gitanjali Express
Departure Time & Place :- 13:40hrs Howrah Station
Reporting Time & Place :- 12:00hrs at Howrah Station New Complex in front of Mail and Express Inquiry

DETAILS of TOUR PROGRAMME

23/02/20:- Start from **Howrah Station** at 13:40 by **12860 Gitanjali** for **Nagpur Station.**

24/02/20:- Reaching **Nagpur Station** at 07:20hrs. Start from **Nagpur Station** at 08:00hrs by Bus for **Tadoba National Park.** Reaching **Tadoba** at 12.00hrs and transfer at Forest **Rest House and Dormitory**.
Afternoon and Evening : Biodiversity specimen collection studies. Night stay at **Tadoba**.

25/02/20:- Morning and Afternoon coverage **Tadoba National Park Safari (Junona and Agarjhari Zone)** by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at **Tadoba.**

26/02/20:- Start from **Tadoba** at 08.00hrs by Bus for **Bor.** Reaching **Bor** at 12.00hrs and transfer at **Forest Rest House** and **Dormitories.**
Afternoon and Evening : Biodiversity specimen collection studies.
Night stay at **Bor.**

27/02/20:- Morning and Evening coverage **Bor National Park Safari (Bordharan)** by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at **Bor.**

28/02/20:- Start from **Bor** at 06.00hrs by Bus for **Nagpur Station.** Reaching **Nagpur Station** at 09.00hrs. Start

from **Nagpur Station** at 10.10hrs by **12129 Azad Hind Express** for **Howrah Station.**

29/02/20:- Reaching **Howrah Station** at 04.15hrs.

TADOBA-ANDHARI TIGER RESERVE

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

Location

Coordinates: 20°10′N 79°24′E
Total area covered by Tadoba National Park is 116.55 sq.kms.
It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.
The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the

Tadoba National Park, created in the year 1955.

History

Legend holds that Taru was a village chief who was killed in a mythological encounter with a tiger. A shrine dedicated to the God Taru now exists beneath a large tree, on the banks of Tadoba Lake. The temple is frequented by adivasis, especially during a fair held annually in the Hindu month of Pausha, between December and January. The Gond kings once ruled these forests in the vicinity of the Chimur hills. Hunting was completely banned in 1935. Two decades later, in 1955, 116.54 square kilometres (45.00 sq mi) was declared a national park. Andhari Wildlife Sanctuary was created in

the adjacent forests in 1986, and in 1995 both the park and the sanctuary were merged to establish the present tiger reserve.
The Andhari Wildlife Sanctuary was formed in the year 1986 and was amalgamated with the park in 1995 to establish the present Tadoba Andhari Tiger Reserve.

Significance

Tadoba National park contains some of the best of forest tracks and endowed with rich biodiversity. It is famous for its natural heritage. Tadoba is an infinite treasure trove of innumerable species of trees and plants - and wildlife that includes Tigers, Panthers, Sloth Bears, Hyenas, Jackals, Wild Dogs, Bison, Barking Deer, Nil Gai, Sambar, and Cheatal.

Known for its rich biodiversity, the Tadoba National Park is nothing less than a paradise for wildlife enthusiasts. Owing to the presence of the big cats, the park was announced as the 41st Tiger Reserve of India. Along with the tigers, the park provides a home to the Wild Boar, Leopard, Spotted Deer, Rusty Spotted Cat, Indian Mouse Deer, Sambar, Gaur, Sloth Beer, Four Horned Antelope, Flying Squirrel and so on.

Etymology

The word 'Tadoba' is derived from the name of God "Tadoba" or "Taru," which is praised by local tribal people of this region and "Andhari" is derived from the name of Andhari river that flows in this area

Type of Forest

Tadoba reserve is a predominantly southern tropical dry deciduous forest

Physical Factors

Temperature:

Winters are cold with average temperature from 9 to 25 degree celcius.

Summers are dry and temperature is between 30 to 45 degrees celcius.

Rainfall:

Tadoba experiences a humid monsoon with rainfall upto 50 inch.

Topography

Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges. Densely forested hills form Northern and Western boundary of this area. Elevation of these hills ranges from 200mts to 350mts

Tadoba lake acts as the buffer between the forest and the extensive farmland which extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

Geography

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smooth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and caves.

provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari ranges. The south part of the park is less hilly than the remainder.

When all work is already done.The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:

Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this

zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

Entry Gates for Safari in Tadoba.

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai, etc. The movement of tourists inside the park is not restricted like in other reserves, therefore one can completely enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

1. Moharli Gate: Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.

2. Kuswanda: The distance between Nagpur and Kuswanda Gate is 140 km and the number of

vehicles allowed for tiger safari from this gate are four each morning and evening.

3. Kolara Gate: This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.

4. Navegaon Gate: The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.

5. Pangdi Gate: The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.

6. Zari Gate: Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

Jeep Safari in Tadoba National Park

The Jeep Safari is the best thing that one can experience in Tadoba National Park. The open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting a tiger and other wild animals are relatively high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more.

The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where the jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives respectively. A park guide has to accompany the jeep for security purpose. Also, the tourists can enter the park by

presenting their personal information and identification papers at the gate and the foreigners by showing their passport in original.

The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

Safari Timing in Tadoba

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Moharli (Mohurli) Zone, Tadoba Zone, and Kolsa Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period Morning Afternoon

	Entry	Exit	Entry	Exit
1st Oct to 30th Nov	6 AM - 8 AM		10:00 AM	
	2.30 PM – 4 PM		6.30 PM	
1st Dec to 28th / 29th Feb	6.30 AM - 8.30 AM			
	11:00 AM	2 PM – 3.30 PM	6:00 PM	
1st Mar to 30th April	5.30 AM – 7.30 AM		10:00 AM	
	3 PM – 4.30 PM		6.30 PM	
1st May – 30thJune	5 AM – 7 AM		9.30 AM	
	3.30 PM – 5 PM		7:00 PM	

Location of the accommodation during our trip

To Reach Tadoba National Park

By Air

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities.

Best Time to Visit Tadoba

March to May is the best time to see tiger as summer temperatures are extremely high especially in the month of May. The monsoon begins from June to September and Vegetation and insect life come alive with the arrival of monsoon in mid June.

The post monsoon starts from October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

Climate and Weather of Tadoba National Park

Winters stretch from November to February and day temperatures is between 25°-30°C and the park is looks green. Summers are too hot in Tadoba as the temperature increases to 47°C; even so it is the ideal time to sight mammals near water lakes as the vegetation is also rare, increasing visibility. The monsoon breaks in June with heavy rainfall of approx.1275 mm. and humidity is around 66%.

Our visit & Census at Tadoba

Map of Maharashtra showing Tadoba Tiger Reserve

Students at Tadoba Tiger Reserve

Students at Tadoba Tiger Reserve

Flora

Bamboo	Bambusa sp.
Ain	Terminalia elliptica
Bija	Pterocarpus marsupium
Haldu	Haldina cordifolia
Salai	Boswellia serrata
Semal	Bombax ceiba
Shisham	Dalbergia sissoo
Bel	Aegle marmelos
Mahua	Madhuca longifolia
Palas	Butea monsperma
Hirda	Terminalia chebula
Tendu	Diospyros melanoxylon
Kusum	Schleichera oleosa
Dhawada	Anogeissus latifolia
Karya gum	Sterculia urens

Mammals	**Sc name**	**Count**
Barking deer	Muntiacus muntjak	2
Sambar deer	*Rusa unicolor*	15
Langur monkey	*Semnopithecus*	18
Wild boar	*Sus scrofa*	4
Tiger(Madhuri)	*Panthera tigris*	1
Tiger cubs	*Panthera tigris*	3
Jackel	*Canis aureus*	1
Indian gour	*Bos gaurus*	3
Dhole		3
Sloth bear	*Melursus ursinus*	3
Spotted deer	*Axis axis*	28
Blue bull	*Boselaphus tragocamelus*	2
Total		84
Birds	***Sc name***	**Count**
Jungle babbler	*Turdois striata*	16
Hornbill	*Buceros bicornis*	2
Purplemoorhen	*Porphyrio porphyrio*	15
Indian long tail shrike	*Laniusschach*	1

Starling	*Lamprotornis hildebrandti*	3
Black hooded oriole	*Oriolus xanthornus*	2
Pond heron	*Ardeola grayii*	3
Purple heron	*Ardea purpurea*	3
Serpent eagle	*Spilornis cheela*	3
Grey heron	*Ardea cinerea*	6
Indian Roller	*Coracias benghalensis*	5
Black drongo	*Dicrurus macrocercus*	6
Koyel	*Eudynamys scolopaceus*	3
Parakeets	*Psittacula krameri*	4
Back heaed ibis	*Theskiornis melanocephalus*	7
Jungle fowl	*Gallus varius*	12
Peafowl	*Pavo cristatus*	14
Kingfisher	*Alcedo atthis*	1
Great cormorant	*Phalacrocoracidae aristotelis*	11
Golden oriole	*Oriolus kundoo*	1

Magpie robin	*Turdus migratorius*	1
Dove	*Spilopelia chinenis*	6
Lapwing	*Vanellus indicus*	4
Bulbul	*Hypsipetes amaurotis*	6
White throated kingfisher	*Haleyon smyrnensis*	3
Jungle owl	*Glaucidium raditum*	1
Cuckoo	*Cocomantis flabelliformis*	2
Spotted billed duck	*Anas poecilorhyncga*	3
Green bee eater	*Merops orientalis*	2
Blue kingfisher	*Alcedo atthis*	1
Rupous treepie	*Dendrocitta vagabunda*	4
Buzzer		2
Rose ringed parrot	*Psittacula krameri*	3

Eurasian thickknee	*Burhinus sp.*	2
Red spur fowl	*Galloperdix spadicea*	1
Little grebe	*Tachybaptus ruficollis*	1
Glossy ibis	*Plegadis falcinellus*	1
Ospyey	*Pandion haliaetus*	1
House sparrow	*Passer domesticus*	1
Shikra	*Accipiter badius*	1
Grey headed fish eagle	*Ichthyophaga ichthyaetus*	1
Graet coucal	*Centropus sinesis*	3
Tailer bird	*Orthotomus sutorius*	4
Woodpeckers	*Picidae sp.*	1
Open billed stork	*Anastomus oscitans*	9
Yellow footed green pegion	*Teron phoenicoptera*	5
Total		221

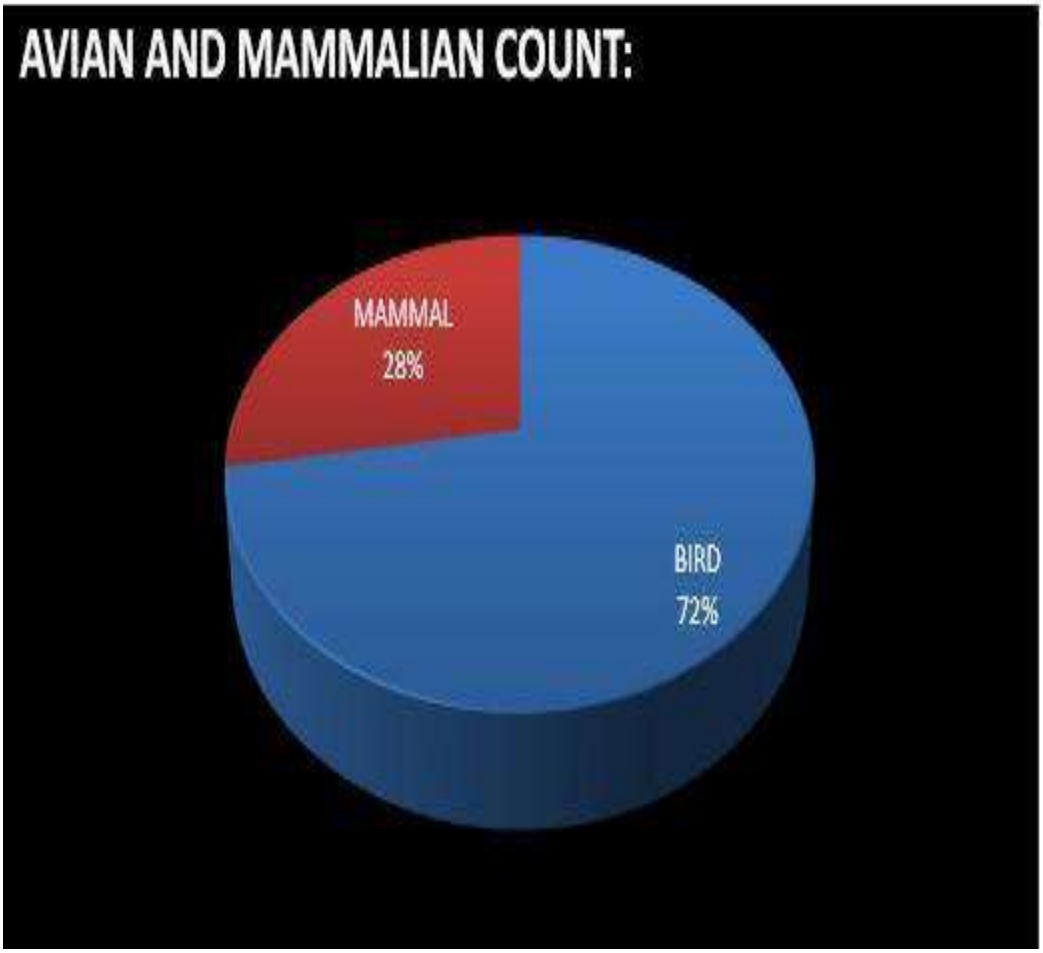


Fig:- Pie chart of mammalian & avian count

Safari census at Tadoba Tiger Reserve

Morning safari(6:30am-10:00am,25.02.20) @Jhunona zone & Afternoon safari (3:30pm-6:00pm,25.02.20) @Agarzari zone

students at safari census in Tadoba tiger reserve

Biodiversity Index

Biodiversity is one of the primary interests of ecologists, but quantifying the species diversity of ecological communities is complicated. In addition to issues of statistical sampling, the rather arbitrary nature of delineating an ecological community, and the difficulty of positively identifying all of the species present, species diversity itself has two separate components:

1.) the number of species present (species richness), and

2.) their relative abundances (termed dominance or evenness).

As a result, many different measures (or indices) of biodiversity have been developed, such as

Shannon index

The idea behind this index is that the diversity of a community is similar to the

amount of information in a code or message. It is calculated in the following way:

$$H' = -\sum \{pi \times \ln(pi)\}$$

Where, pi is the proportion of individuals found in species i. For a well-sampled community, we can estimate this proportion as

$$pi = ni/N,$$

where, ni is the number of individuals in species i and N is the total number of individuals in the community.

Since by definition the pis' will all be between zero and one, the

natural log makes all of the terms of the summation negative, which is why we take the inverse of the sum.

Interpretation:

Typical values are generally between 1.5 and 3.5 in most

ecological studies, and the index is rarely greater than 4. The Shannon index increases the richness of the community increase. The

fact that the index incorporates both components of biodiversity can be seen as both a strength and a weakness. It is a strength because it provides a simple, synthetic summary, but it is a weakness because it makes it difficult to compare communities that differ greatly in richness. Due to the confounding of richness and evenness in the Shannon index, many biodiversity researchers prefer to stick to two numbers for comparative studies, combining a direct estimate of species richness (the total number of species in the community, S) with some measure of dominance or evenness. The most common dominance measure is Simpson's index.

Simpsons index

Since evenness and dominance are simply two sides of the same coin, their measures are complimentary. Simpsons index is based on the probability of any two individuals drawn at random from an infinitely large community belonging to the same species:

$D = \sum pi^2$

where again pi is the proportion of individuals found in species i. For a finite

community, this is

$D = \sum ni(n\_i-1))/(N(N-1))$

Interpretation:

Now D is a measure of dominance, so as D increases, diversity (in

the sense of evenness) decreases. Thus, Simpson's index is usually reported as its complement 1-D (or sometimes 1/D or –lnD). Since D takes on values between zero and one and approaches one in the limit of a monoculture, (1-D) provides an intuitive proportional measure of diversity that is much less sensitive to species richness.

Fig:- yellow footed green pigeon

Tiger Madhuri (up) & cotton pygmy goose(down)

peafowl(up) & languor monkey (down)

Sambar deer(up) & Indian roller (down)

Termitarium (up) & Asian open billed stork

Mammalian diversity (Shannon Diversity index)

Name	Count	pi	ln(pi)	Pi*ln(pi)
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gour	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053
Total	84			1.618

Avian diversity

Name	Count	pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190
Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042
Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098
Koyel	3	0.013	-4.299	-0.058
Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149

Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073
Bulbul	6	0.027	-3.606	-0.098
White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042
Spotted billed duck	3	0.013	-4.299	-0.058
Green bee eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufous treepie	4	0.018	-3.452	-0.109
Rose ringed parrot	3	0.013	-4.299	-0.058
Great coucal	3	0.013	-4.299	-0.058

Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002
Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002
House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thickknee bird	2	0.009	-4.705	-0.042
Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013
Purple heron	3	0.013	-4.299	-0.058
Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109

Serpent eagle	3	0.013	-4.299	-0.058
Yellow headed fish eagle	1	0.004	-5.398	-0.002
Yellow footed green pegion	5	0.023	-3.788	-0.085
Indian long tailed shrink	1	0.004	-5.398	-0.002
Total	221			2.766

Pie chart of biodiversity index (based on Shannon Winner diversity index)

peafowl(up) & black headed ibis(down)

Indian long tailed shrike (up) & lesser egret (down)

sloth bear(up) & nest of tailor bird(down)

rose ringed parakeet (up) & serpent eagle(down)

Spotted deer(up) & Indian roller (down)

Simpson diversity index

Mammalian diversity index

Species name	Count	ni (ni-1)	[ni (ni-1)]÷ [N(N-1)]
Barking deer	2	2	0.00029
Sambar deer	15	210	0.03
Langur monkey	18	306	0.044
Wild boar	4	12	0.0017
Tiger	4	12	0.0017
Jackel	1	0	0
Gour	3	6	0.00086
Dhole	3	6	0.00086
Sloth bear	3	6	0.00086
Blue bull	2	2	0.00029
Total	84		0.08056

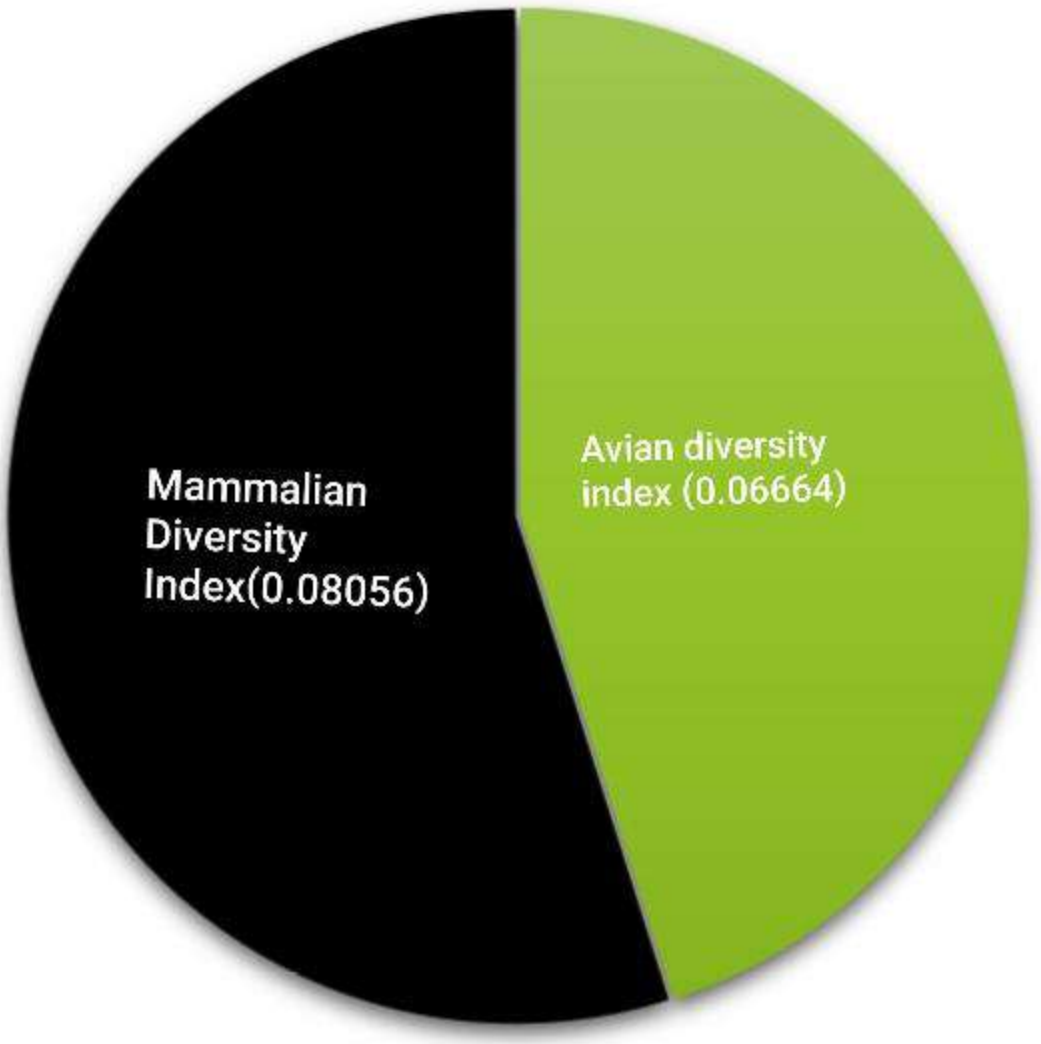
Avian diversity

Name	Count	Ni (ni-1)	[Ni(ni-1)]÷ [N(N-1)]

Jungle babbler	16	240	0.0049
Hornbill	2	2	0.00004
Black hooded oriole	2	2	0.00004
Cuckoo	2	2	0.00004
Buzzer	2	2	0.00004
Eurasian thickknee	2	2	0.00004
Green bee eater	2	2	0.00004
Purple moorhen	15	210	0.0044
Long tailed shrike	1	0	0
Common kingfisher	1	0	0
Golden oriole	1	0	0
Robin	1	0	0
Jungle owl	1	0	0

Blue kingfisher	1	0	0
Red spur fowl	1	0	0
Little grebe	1	0	0
Glossy ibis	1	0	0
Osprey	1	0	0
House sparrow	1	0	0
Shikra	1	0	0
Grey heaaded fish eagle	1	0	0
Starling	3	6	0.00012
Pond heron	3	6	0.00012
Purple heron	3	6	0.00012
Serpent eagle	3	6	0.00012
Koyel	3	6	0.00012
Spotted billed duck	3	6	0.00012

Rose ringed parrot	3	6	0.00012
Great coucal	3	6	0.00012
Grey heron	6	30	0.0006
Dove	6	30	0.0006
Bulbul	6	30	0.0006
Black drongo	6	30	0.0006
Parakeet	4	12	0.00025
Lapwing	4	12	0.00025
Rupous treepie	4	12	0.00025
Tailor bird	4	12	0.00025
Black ibis	7	42	0.00086
Open billed stork	9	72	0.0015
Jungle fowl	12	132	0.0027
Peafowl	14	182	0.0037
Cormorant	11	110	0.0026
Total	221		**0.06664**



Pie chart for Mammalian & Avian diversity index(based on Simpson's index)

Quantitative Assesses of abiotic components

Place	**Date**	**Time**	**Temperature**
Tadoba-andheri tiger reserve	26.02.2020	6:45am	17.5°C
Tadoba-andheri tiger reserve	26.02.2020	8:45pm	23°C

Place	Date	Time	pH
Tadoba-andheri tiger reserve	26.02.2020	7am	7.3

Pitfall Trapping

Pitfall-traps: For Soil-surface-active Invertebrates

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup,

and they may be baited to capture more specific types of insects.

Requirements

- While carrying out Pitfall Trapping

1. Containers
2. Soap water
3. 70% Ethyl Alcohol
4. Forceps
5. Sterile Gloves
6. Sugar

Methodology

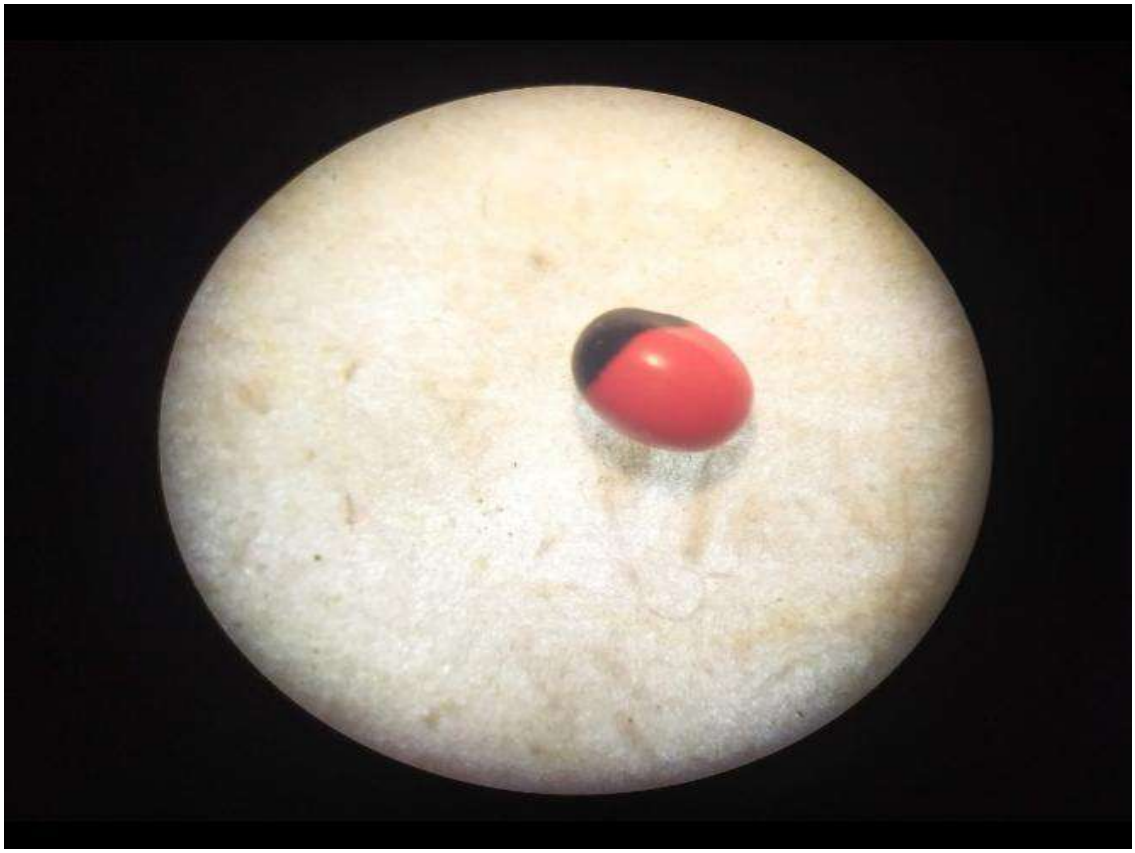
For the Pitfall traps, four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.
- Soap water was poured into the containers to make the surface slippery and thereby ensuring the avoidance of escape attempts by the captured insect.
- The pitfall trap was allowed to remain intact for about 6 hours. The collected insects were then poured into containers with 70% ethyl alcohol.
- Ethyl Alcohol was used as a preservative for the soft bodied animals as it maintained their elemental composition.

students performing pitfall trapping

Insects (arthropods) from pitfall trapping



insects(arthropods) from pitfall trapping

BUSH BEATING

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

Requirements:

1. Umbrella
2. Stick/Staff
3. 70% Ethyl Alcohol
4. Air-tight Containers
5. Sterile Gloves
6. Tape

Methodology

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

students performing bush beating

Insects(arthropods) from bush beating

Insects(arthropods) from bush beating

Study of Quadrat

Principle:- when an ecologist wants to know how many organizations there are in an particular habitat, it would not be feasible to count them all. Instead he would be forced to count a smaller representative part of the population called sample. Sampling of plants & animals that don't move much(such as snails) can be done by using sampling square called quadrat. A suitable size of quadrat depends upon size of the organisms being sampled. For example to count plants growing on college campus one could use a quadrat with size 0.5to 1 meter in length.

Materials & methods of insects collection

1. Small garden gloves
2. Forceps
3. A kill jar containing 70% alcohol

4. Insect pins
5. Ziploc packets & plastic container
6. Labels
7. Strings
8. Wood poles
9. Magnifying glass
10. Newspaper for collection

Methodology

A suitable site was selected for quadrat work to be done. An area of 1sq was measured & the region was demarcated with the help of string. The string was fixed in square form 1meter*1meter & the corners were fixed with wood poles. Thus the quadrat was formed & various species of flora & fauna were collected with the help of forceps.

students performing quadrat study

insects(arthropods) from Quadrat study

insects(arthropods) from Quadrat study

Pug Marking

Pug marking is the term used to refer to the footprint of most animals (specially mega fauna). “Pug” means foot in Hindi (Sanskrit –Padh; Greek – Ped. Every individual animal species has a different pugmark and as such it is used for identification.

IMPORTANCE OF PUGMARK:

- Wildlife conservationists are known to catalogue pugmarks in the areas they operate.
- Pugmarks are also for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries, etc.
- It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.

TO MAKE A PLASTER CAST

MATERIALS:

- Plaster of Paris (medical quality)
- Water
- A mug to prepare paste
- A strip of thick paper or flexible aluminum.

Pug mark of Tiger(up),pug mark of sloth bear(down)

TIGER AS A KEYSTONE SPECIES

- A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether. A keystone species is often, but not always, a predator.

- Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex species can regulate species abundance, diversity, distribution; which in turn can impact the health of terrestrial habitats.
- Additionally they provide essential food sources for the grazers and remove the sick and weak from population of prey species.
- The decimation of these tiger species can have cascading effects throughout the

ecosystem they inhabit, resulting in economically and ecologically devastating consequences.

- In India's Kanha National Park, the keystone species is Tiger and the jewel has been described as "barasinha". Tiger is the largest of the world's great cats. Barasinha, gaur, sambar, chital, nilgai help to maintain wildlife population.

  Fig:Tiger in Tadoba Tiger Reserve

ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to our respected professors Dr. **Swagata Chattopadhyay, Dr. Narayan Chandra Das, Dr. Samrat Bhattacharjee , Dr. Partha Pal, Dr. Aniruddha Chatterjee, Dr. Malini kundu, Sri Sunil kr Pramanik** as well as our principal ma'am Dr. **Arpita Mukerji** & vice principal sir **Dr. Supratim Das** who gave us the golden opportunity to do this wonderful field report , which also helped us in doing a lot of Research and we came to know about so many new things we're really thankful to them.

Secondly I would also like to thank **all my classmates** who helped me a lot in finalizing this report within the limited time frame. Without all these helping hands I'll never be able to finish the field report of our memorable excursion to Tadoba-andhari tiger reserve.

Date-12.03.2021

UNIVERSITY OF CALCUTTA

FIELD REPORT ON BIODIVERSITY

BSC HONOURS SEMESTERV UNDER CBCS 2020

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INDEX

INTRODUCTION

AIM OF EXCURSION:

The purpose of zoological excursion is to gain a much deeper knowledge about the topics related to the subject such as wildlife, nature and environment with the help of practcal demonstraton along with theoretcal facts. While their purpose is essental to educate, the can also be a fun bonding experience for ever one involved, the knowledge of bioscience is incomplete. It also provides a scope to stud wildlife and observe animals and their behaviours in their natural habitat.

Hence zoological excursion helps us to come in close contact with the fora and fauna of various places with diferent climatc conditons and atmospheric variatons and in beter understanding of the relaton between fora and fauna.

Purpose of excursion notebook:

Field notes refer to qualitatve notes recorded b scientsts or researchers or students in the course of feld research, during or afer their observaton of a specifc organism or phenomenon the are stud ing.

- The notes are intended to be read as evidence that gives meaning and aids in the understanding of the phenomenon.
- Field notes allow the researcher to access the subject and record what the

observe in an unobtrusive manner.

- Field notes are partcularl valued in descriptve sciences such as ethnograph , biolog , ecolog , geolog , and archaeolog , each of which have long traditons in this area.
- Writng in such a detailed manner ma contribute to the personal development of a student.

Basic requirements for good notes:

- **ACCURACY:** B far the most important aspect of feld notes.
- **INTEGRITY:** (Complete) If the feld crew fail to collect all important data, costl dela s can occur in the ofce.
- **LEGIBILITY:** Major error can occur if notes can't be easil read.
- **ARRANGEMENT:** Following a standard note format, save tme and mone when tr ing to follow notes.
- **CLARITY:** Well planned surve with clear special

notatons and sketches will greatl add to the understanding of the surve .

Importance of excursion notebook:

An outstanding feld notebook serves man potental purposes.

1. It is a valuable record of what ou have seen, heard, discussed and thought about in the feld.
2. It ma contain the data which will lead to an oral presentaton, a paper, and/or a thesis.
3. It ma be graded porton of a course.
4. It ma be something ou and our relatves will fnd interestng decades in the future.

BIODIVERSITY

Biodiversit refers to the variet and variabilit of life on Earth. Biodiversit t picall measures variaton at the genetc, species, and ecos stem level. Terrestrial biodiversit is usuall greater near the equator, which is the result of the warm climate and high primar productvit .

Biodiversit is not distributed evenl on Earth, and is richest in the tropics. These tropical forest ecos stems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversit is usuall highest along coasts in the Western Pacifc, where sea surface temperature is highest, and in the mid-lattudinal band in all oceans.

There are lattudinal gradients in species diversit . Biodiversit generall tends to cluster in hotspots, and has been increasing through tme, but will be likel to slow in the future.

Types of Biodiversity:

Genetic Diversity :

- Diferent genes and combinatons of genes within populatons
- Allows populaton of a species to adopt to environmental changes

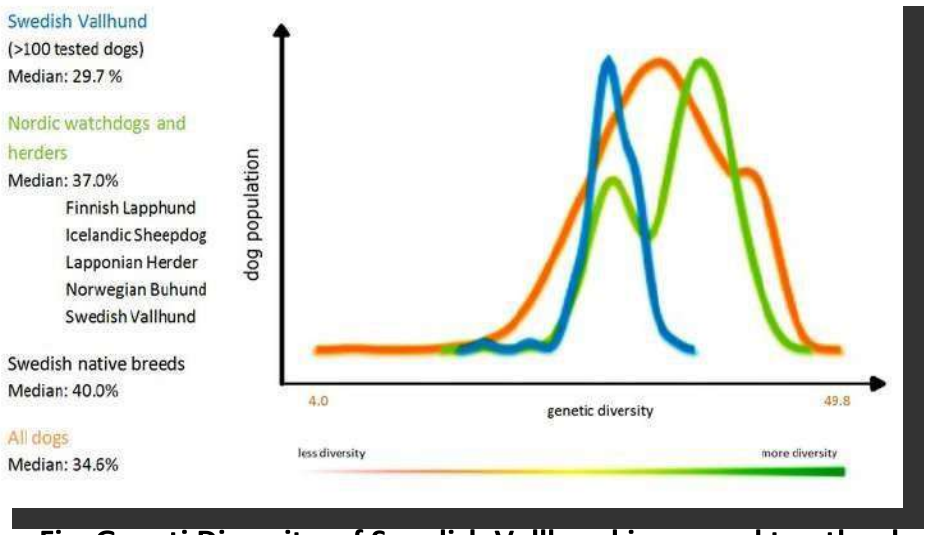


Fig: Geneti Diversity of Swedish Vallhund iompared to other breeds.

Species Diversity :

- Diferent kinds of organism, relatonships among species
- Refers to the number of kinds of species being found

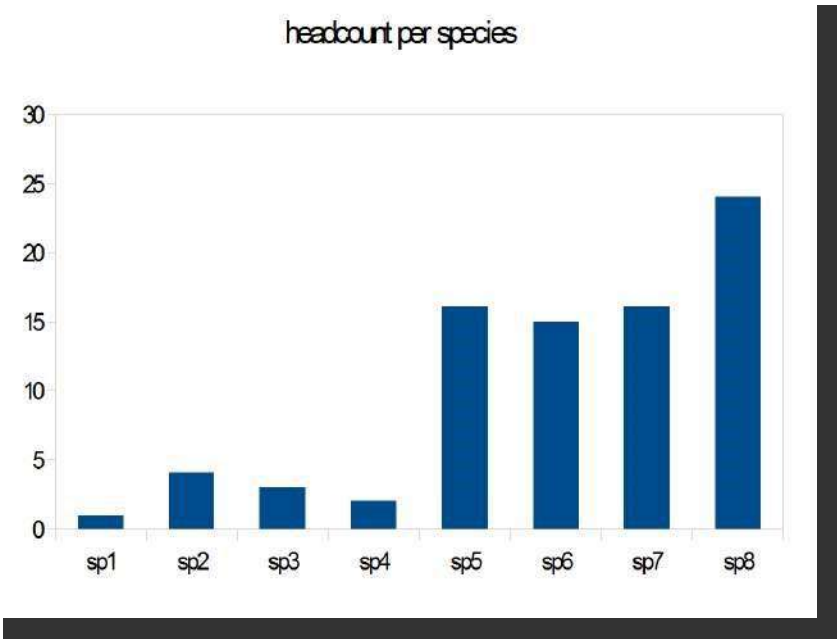


Fig: Fluituatons in speiies number .

Ecological Diversity :

- Diferent habitats, niches, species interactons
- An assemblage of species living in the same area and interactng with an environment

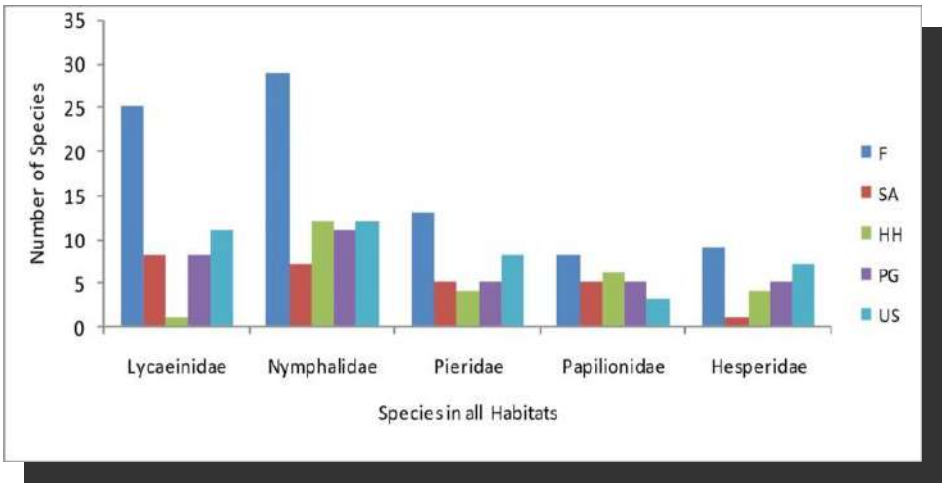


Fig: Speiies diversity in various Habitats .

EXCURSION DIARY:

ITIENERY:

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE :

Date of Journe	:-	23rd Februar 2020
Train No & Name	:-	12860 Gitanjali Express
Departure Time & Place	:-	13:40hrs Howrah Staton
Reportng Time & Place and Express Inquir	:-	12:00hrs at Howrah Staton New Complex in front of Mail

DETAILS of TOUR PROGRAMME:

23/02/20:- Start from **Howrah Staton** at 13:40 b 12860 Gitanjali for **Nagpur Staton.**

24/02/20 : - Reaching **Nagpur Staton** at 07:20hrs. Start from **Nagpur Staton** at 08:00hrs b Bus for **Tadoba Natonal Park.** Reaching **Tadoba** at 12.00hrs and transfer at Forest **Rest House and Dormitory** .
Afernoon and Evening : Biodiversit specimen collecton studies. Night sta at **Tadoba**.

25/02/20:- Morning and Afernoon coverage **Tadoba Natonal Park Safari (Junona and Agarjhari Zone)** b Z ps from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversit studies.
Night sta at **Tadoba.**

26/02/20:- Start from **Tadoba** at 08.00hrs b Bus for **Bor.** Reaching **Bor** at 12.00hrs and transfer at **Forest Rest House** and **Dormitories.**
Afernoon and Evening : Biodiversit specimen collecton studies. Night sta at **Bor.**

27/02/20:- Morning and Evening coverage **Bor Natonal Park Safari (Bordharan)** b Z ps from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversit studies.
Night sta at **Bor at Maharastra Tourism Aiiomodaton.**

28/02/20:- Start from **Bor** at 06.00hrs b Bus for **Nagpur Staton.** Reaching **Nagpur Staton** at 09.00hrs. Start from **Nagpur Staton** at 10.10hrs b **12129 Azad Hind Express** for **Howrah Staton.**

29/02/20:- Reaching **Howrah Staton** at 04.15hrs.

? ACCOMPANYING PERSONS:

- **Prof. Swagata Chatopadhy ay .**
- **Sri Sunil Kr. Pramanik.**

MAP OF MADHYA PRADESH & MAHARASHTRA

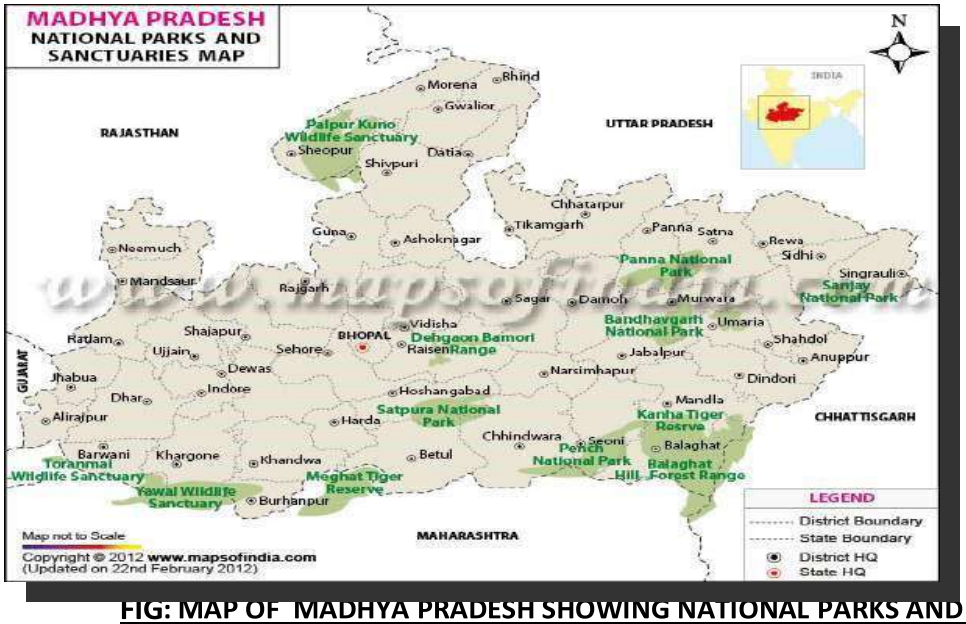


FIG: MAP OF MADHYA PRADESH SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

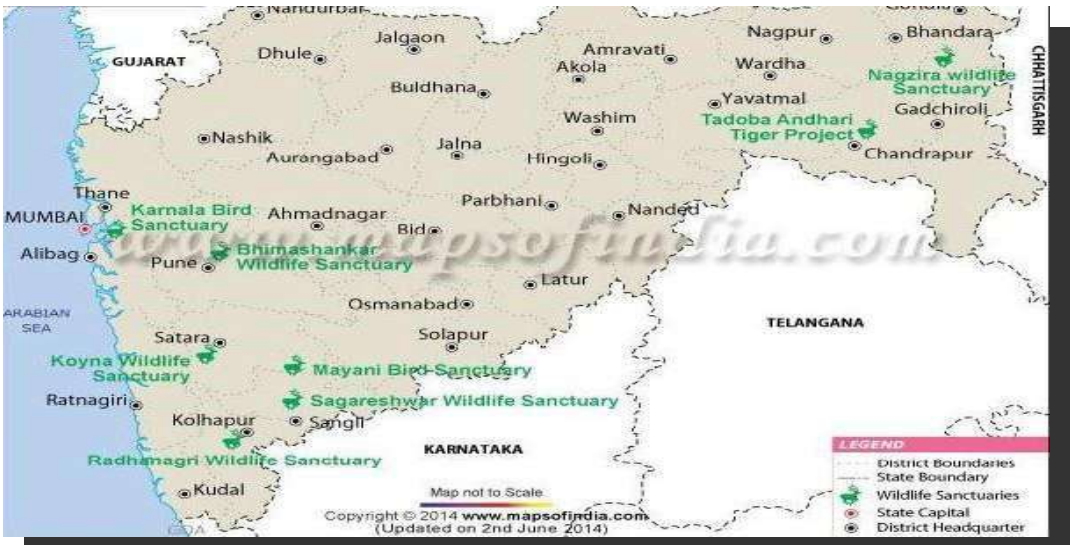


FIG: MAP OF MAHARASHTRA SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

TADOBA ANDHARI TIGER RESERVE

FIG: MAP OF TADOBA ANDHERI TIGER RESERVE.

Notabl Maharashtra's oldest and largest Natonal Park, the "Tadoba Natonal Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tger reserves existng in India.

Location:

Coordinates: 20◦10’N 79◦24’E

Total area covered b Tadoba Natonal Parkis 116.55 sq.kms.

It lies in the Chandrapur district of Maharashtra state and is approximatel 150 km from Nagpur cit .

The total area of the Tadoba-Andhari tger reserve is 1,727 Sq.km, which includes the Tadoba

Natonal Park, created in the ear 1955.

History:

Legend holds that Taru was a village chief who was killed in a m thological encounter with a tger. A shrine dedicated to the God Taru now exists beneath a large tree, on the banks of Tadoba Lake. The temple is frequented b adivasis, especiall during a fair held annuall in the Hindu month of Pausha, between December and Januar .

The Gond kings once ruled these forests in the vicinit of the Chimur hills. Huntng was completel banned in 1935. Two decades later, in 1955, 116.54 square kilometres (45.00 sq mi) was declared a natonal park. Andhari Wildlife Sanctuar was created in the adjacent forests in 1986, and in 1995 both the park and the sanctuar were merged to establish the present tger reserve.

The Andhari Wildlife Sanctuar was formed in the ear 1986 and was amalgamated with the park in 1995 to establish the present Tadoba Andhari Tiger Reserve.

Significance :

Tadoba Natonal park contains some of the best of forest tracks and endowed with rich biodiversit . It is famous for its natural heritage. Tadoba is an infnite treasure trove of innumerable species of trees and plants - and wildlife that includes Tigers, Panthers, Sloth Bears, H enas, Jackals, Wild Dogs, Bison, Barking Deer, Nil Gai, Sambar, and Cheatal.

Known for its rich biodiversit , the Tadoba Natonal Park is nothing less than a paradise for wildlife enthusiasts. Owing to the presence of the big cats, the park was announced as the 41st Tiger Reserve of India. Along with the tgers, the park provides a home to the Wild Boar, Leopard, Spoted Deer, Rust Spoted Cat, Indian Mouse Deer, Sambar, Gaur, Sloth Beer, Four Horned Antelope, Fl ing Squirrel and so on.

Etymology:

The word 'Tadoba' is derived from the name of God "Tadoba" or "Taru," which is praised b local tribal people of this region and "Andhari" is derived from the name of Andhari river that fows in this area

Type of Forest:

Tadoba reserve is a predominantl southern tropical dr deciduous forest

Physical Factors:

Temperature:

Winters are cold with average temperature from 9 to 25 degreecelcius.

Summers are dr and temperature is between 30 to 45 degrees celcius.

Rainfall :

Tadoba experiences a humid monsoon with rainfall upto 50 inch.

Topography:

Tadoba mainl covers Chimur hills and parts of Moharli and Kolsa ranges. Densel forested hills form Northern and Western boundar of this area. Elevaton of these hills ranges from 200mts to 350mts Tadoba lake acts as the bufer between the forest and the extensive farmland which extends upto Iris water reservoir, ofering good habitat for Muggar crocodiles to thrive.

Geography:

Tadoba Andhari Reserve is the largest natonal park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba Natonal Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuar with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a bufer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which ofers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuar covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides b densel forested hills. Thick forests are relieved b smooth meadows and deep valle s as the terrain slopes from north to south. Clifs, talus, and caves provide refuge for several animals. The two forested rectangles are formed of the Tadoba

and Andhari ranges. The south part of the park is less hill than the remainder.

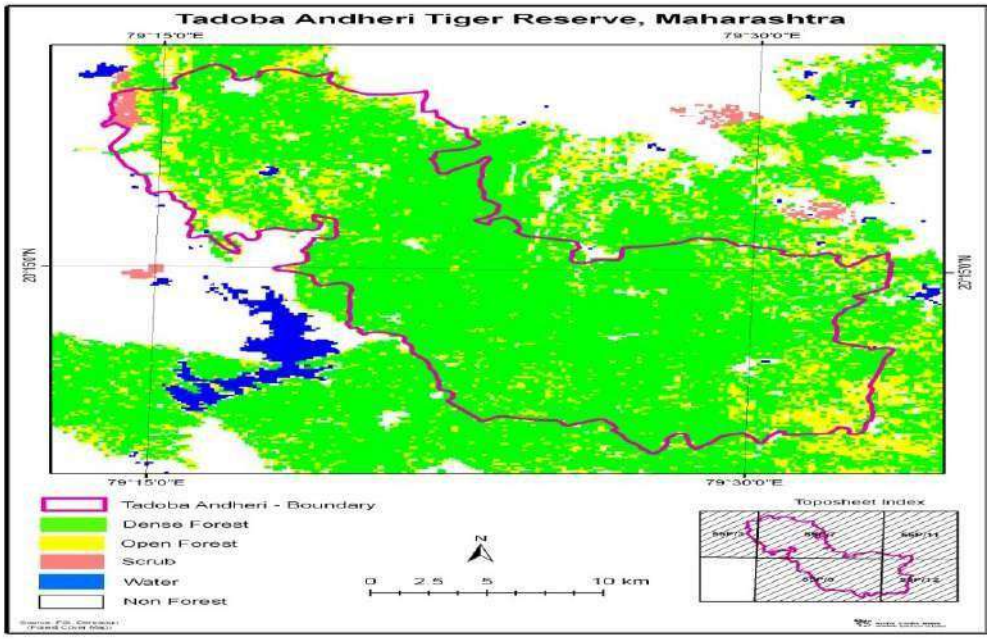


Fig: Map of Tadoba –Andhari Tiger Reserve with lattude and longitude

SAFARI ZONES IN TADOBA:

The Tadoba Andhari Tiger Reserve is one of the fnest places to see Ro al Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tger safari" that ofers a wide view of the habitat and a chance to see tgers and other animals in the wild. The reserve is divided into three zones, each having diferent access gates:

Moharli (Mohurli) Zone: This zone is known for the best tger spoong and is also popular for ofering good accommodaton facilites to the tourists. The Moharli Gate is easil accessible from other two zone of Tadoba namel Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for ofering diverse wildlife and scenic locatons to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilites of spoong the wild animals are relatvel lower in this zone. Entr to this zone is possible through gates at Moharli, Pangdi, and Zari.

Entry Gates for Safari in Tadoba:

There are six gates in the Tadoba Tiger Reserve that gives aiiess to the wild world ionsists of animals like tgerss leopardss sloth bears hy enas jaikals wild dogs sambars iheetals langoorss nilgais eti. The movement of tourists inside the park is not restriited like in other reservess therefore one ian iompletely enjoy a jeep safari all over the park. The names of the gates at Tadoba Natonal Park are listed below:

1. **Moharli Gate**: Moharli Gate is the oldest entrance to the park, which is located approximatel 180 kilometers awa from Nagpur. There is entr of nine vehicles each morning and evening for tger safari from this gate.

2. **Kuswanda:** The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tger safari from this gate are four each morning and evening.

3. **Kolara Gate:** This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a da .

4. **Navegaon Gate:** The distance from Nagpur to the gate is 140 km. The park authorit permits the entr of six vehicles each morning and evening for tger safari from this gate. 5. **Pangdi Gate:** The distance between Pangdi gate and Nagpur is 250 km and the number

of vehicles allowed for tger safari are two each morning and evening, making it a total number of four rides a da .

6. **Zari Gate:** Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tger safari hence twelve rides are available for the tourists in a da .

- Jeep Safari in Tadoba National Park:

The Jeep Safari is the best thing that one can experience in Tadoba Natonal Park. The open Jeep ride, also known as tger safari is usuall of few hours in the dense reserve, where the chances of spoong a tger and other wild animals are relatvel high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and man more.

The Jeep Safari tmings are fxed b the Tadoba Administraton in the morning and evening, where the jeeps are allowed for excursion onl afer the registraton with the administraton. The entr of the Jeep has to be registered at the park gate itself followed b a prescribed charge that has to be paid before making the entr . The park authorit has restricted the total number of jeeps to 36 for the morning and evening drives respectvel . A park guide has to accompan the jeep for securit purpose. Also, the tourists can enter the park b presentng their personal informaton and identfcaton papers at the gate and the foreigners b showing their passport in original.

The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In additon, the need to follow set of rules and regulatons at the tme of tger safari, which the park guide can explain as he/she is completel aware of that.

Safari Timing in Tadoba:

The safari in Tadoba Tiger Reserve will give opportunit to explore the rich wildlife of the park and spot the animals like tger, leopard, wild dogs, sloth bear, etc. There are two zones in the reserve that gives access to the Jeep Safari, namel Junona zone and agazari zone. The tmings of the Jeep Safari for the winter and summer are mentoned below:

Period	Morning		Afernoon	
	Entr	Exit	Entr	Exit
25th februar	6 AM - 8 AM	10:00 AM	2.30 PM – 4 PM	6.30 PM

To Reach Tadoba National Park

By Air :

Tadoba Natonal Park is 140 Km awa from Dr. Babasaheb Ambedkar Internatonal Airport, Nagpur. Regular fights f from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train:

Chandrapur Railwa Staton is the nearest railhead from the Natonal Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cites like Delhi, Chennai, H derabad, Mumbai and Jhansi. Taxis and buses are available from railwa staton to reach the Tadoba Tiger Reserve.

By Road:

Tadoba Natonal Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected b road with all major cites.

Best Time to Visit Tadoba:

March to Ma is the best tme to see tger as summer temperatures are extremel high especiall in the month of Ma . The monsoon begins from June to September and Vegetaton and insect life come alive with the arrival of monsoon in mid June. The post monsoon starts from October to November, which is also the best tme to visit Tadoba Wildlife Sanctuar as ou will feel refreshing viewing the lush green jungle sprawled with fowers. Winter season begins from December to Februar , though temperature remains quite warm during these months due to the tropical climate.

Climate and Weather of Tadoba National Park

Winters stretch from November to Februar and da temperatures is between 25°-30°C and the park is looks green. Summers are too hot in Tadoba as the temperature increases to 47°C; even so it is the ideal tme to sight mammals near water lakes as the vegetaton is also rare, increasing visibilit . The monsoon breaks in June with heav rainfall of approx.1275 mm. and humidit is around 66%.

GROUP PHOTO AT TIGER ANDHERI RESERVE

BIODIVERSITY- THE KEY OF DIVERSITY

Biodiversit is the root of all living s stem. The earth is home to a rich and diverse arra of living organism. The biodiversit is the natural biological capital of earth and presents opportunit to all.

India has a rich varied heritage of biodiversit , consistng of a wide spectrum of habitats. Biodiversit is indeed the bedrock of all bioindustrial development in the unusuall large rural sector of our countr . It is of enormous importance for human welfare.

Flora

Bamboo (*Bambusa sp*.)

Ain (*Terminalia elliptiaa*

Bija (*Pteroiarpus marsupiuma*

Haldu (*Haldinaiordifoliaa*

Salai (*Boswellia serrataa*

Semal (*Bombax ieiba*)

Shisham (*Dalbergia sissooa*

Bel (*Aegle marmelosa*

Mahua (*Madhuialongifoliaa*

Palas (*Butea monspermaa*

Hirda (*Terminalia ihebulaa*

Tendu (*Diospyros melanoxylona*

Kusum (*Sihleiiheraoleosaa*

Dhawada (*Anogeissuslatfoliaa*

Karya gum (*Steriuliaurensa*

SAFARI CENSUS

We iompleted a total of 2 safaris in 1 Proteited Areas namely s Tadoba-Andhari Tiger Reserve.

We went on all the safaris on Gy psies.

Tadoba-Andhari Tiger Reserve Census:

- **Junona zone(Morning Safari) &**
- **Agarzari Zone (Afernoon Safari)**

Avian Fauna

Species	Scientifcc Name	Count
1. Black Drongo	*Diirurus mairoierius*	6
2. Parakeet	*Psitaiula iyanoiephala*	4
3. Black headed ibis	*Threskiornis melanoiephalus*	7
4. Lesser egret	*Egreta garzeta*	14
5. Lesser whistling duck	*Dendroiygnajavaniia*	17
6. Jacana	*Metopidius indiius*	3

7. White eyed buzzard	*Butastur teesa*	2	
8. Indian magpie Robin	*Turdus migratorius*	2	
9. Common Kingfisher	*Haleyon smyrnesis*	3	
10. Blue kingfisher	*Alcedo atthis*	1	

37. Spoted-billed duck	*Anus poeiilorhyniga*	3	
38. Indian Long tailed shrike	*Lanius sihaih*	1	
39. Greater Coucal	*Centropus sinesis*	3	
40. Common Tailorbird	*Orthotomus sutorius*	4	
41. Woodpecker	*Piiidae sp.*	1	
42. Eurasian Thick -knee bird	*Burhinus oediinemus*	2	
43. Red spurfowl	*Galloperdix spadiiea*	1	
44. Litle Grebe	*Taihybapts rufiollis*	1	
45. Gloss Ibis	*Plegadis faliinellus*	1	
46. Ospre	*Pandion haliaetus*	1	
47. House sparrow	*Passer domestius*	1	
48. Shikra	*Aiiipiter badius*	1	
TOTAL OBSERVED:		**221**	

Mammalian Fauna

Species	***Scientific Name***	**Count**
1.Spoted deer	*Axis axis*	28
2.Langur	*Semnopitheius entellus*	18
3.Sambar	*Rusa uniiolor*	15
4.Barking deer	*Muntaius muntjak*	2
5. Indian Gaur	*Bos gaurus*	3
6.Dhole	*Cuon alpines*	4
7. 7.Sloth bear	*Melursus ursinus*	3
8.Jackal	*Canis aureous*	1
9.Wild boar	*Sus sirofa*	4
10. Blue bull (nilgai)	*Boselaphus tragoiamelus*	2

11.Tiger	*Panthera tgris*	1
12.Tiger cubs	*Panthera tgris*	3
TOTAL OBSERVED		**84**

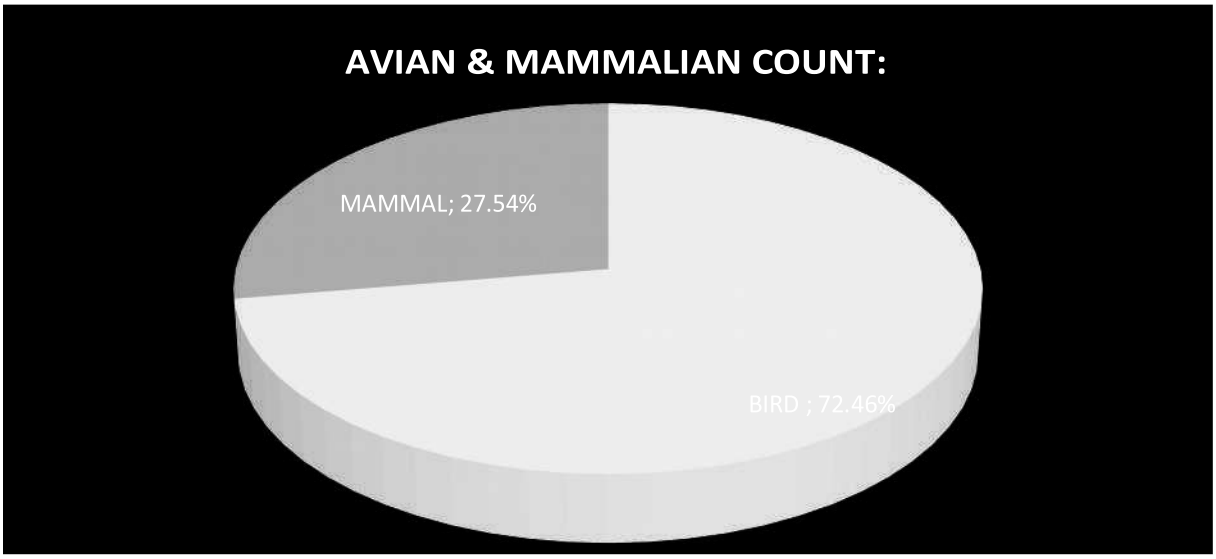


FIG: PIE-CHART OF AVIAN AND MAMMALIAN COUNTS

BIODIVERSITY INDICES

Biodiversit is one of the primar interests of ecologists, but quantf ing the species diversit of ecological communites is complicated. In additon to issues of statstcal sampling, the rather arbitrar nature of delineatng an ecological communit , and the difcult of positvel identf ing all of the species present, species diversit itself has two separate components:

1.) The number of species present (*speiies riihness*), and
2.) Their relatve abundances (termed *dominanie* or *evenness*).
As a result, man diferent measures (or indices) of biodiversit have been developed, such as

1.cShNannoncindexc

The idea behind this index is that the diversit of a communit is similar to the amount of informaton in a code or message. It is calculated in the following wa :

$$H' = \sum\{p_i \times \ln(p_i)\}$$

Where, pi is the proporton of individuals found in species i. For a well-sampled communit , we can estmate this proporton as pi = ni/N, where, ni is the number of individuals in species i and N is the total number of individuals in the communit .
Since b defniton the pis' will all be between zero and one, the natural log makes all of the terms of the summaton negatve, which is wh we take the inverse of the sum.

Interpretation:

T pical values are generall between 1.5 and 3.5 in most ecological studies, and the index is rarel greater than 4. The Shannon index increases the richness of the communit increase. The fact that the index incorporates both components of biodiversit can be seen as both a strength and a weakness. It is a strength because it provides a simple, s nthetc summar , but it is a weakness because it makes it difcult to compare communites that difer greatl in richness. Due to the confounding of richness and evenness in the Shannon index, man biodiversit researchers prefer to stck to two numbers for comparatve studies, combining a direct estmate of species richness (the total number of species in the communit , S) with some measure of dominance or evenness. The most common dominance measure is Simpson's index.

SHANNON-WEINER INDEX

The Shannon-Weiner index being a measure of uncertaint , thus measures the diversit of a partcular bio geographical region.

As a part of our endeavours to stud the statstcal aspect and interpretatons of biodiversit , the various Shannon-Weiner indices of the four forests: Tadoba, Navegaon, Nagzira and Pench were calculated.

Interpretatons of the mathematcal data provide an insight into the biodiversit distributon of the fauna and hence are refected b the species richness of the forests under stud .

Avian diversity

Name	Count	Pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190
Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042
Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098
Koyel	3	0.013	-4.299	-0.058
Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149
Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073
Bulbul	6	0.027	-3.606	-0.098
White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042

Spotted billed duck	3	0.013	-4.299	-0.058
Green bee eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufoustreepie	4	0.018	-3.452	-0.109
Rose ringed parrot	3	0.013	-4.299	-0.058

3.

Mammalian diversity

Name	Count	Pi	ln(pi)	Pi*ln(pi)
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gour	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053
TOTAL				**+2.766**

Henies the total biodiversity index of TADOBA ANDHERI TIGER RESERVE

is:MAMMALIAN FAUNA+ AVIAN FAUNA= 4.384.

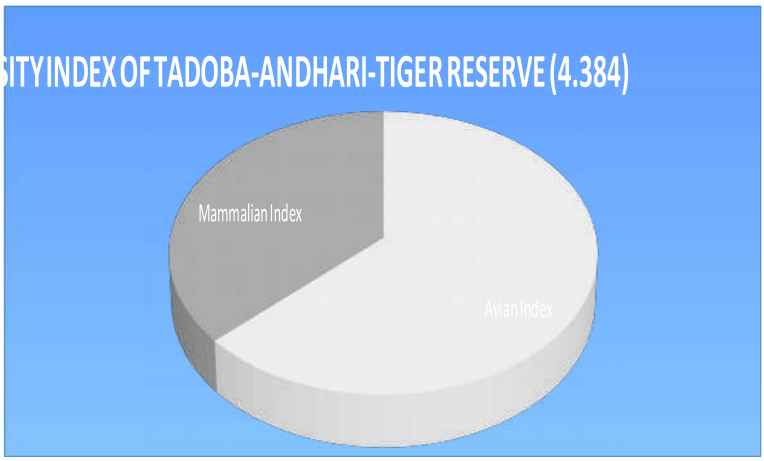


FIG: PIE CHART OF BIODIVERSITY INDEX

FAUNAL DIVERSITY

MAMMALIAN FAUNA

Panthera tgris (Tiger)

Melursus Uranus(sloth bear)

Rusa uniiolor (Sambar Deer)

Semnopitheius entellus (Langoor)

Axis axis (Spoted Deer)

Bos gaurus (Indian gaur)

AVIAN FAUNA

Threskiornis melanoiephalus (Black headed Ibis)

Treron phoeniioptera (Yellow footed green pigeon)

White throated kingfsher

Psitaiula krameri (Rose ringed Parakeet)

Accipiter badius

Indian Roller

Asian open Billed Stork

Crested sarpent Eagle

Coton Py geme Goose

White ey ed Buzzard

Pavo iristatus (PeaFowl)

BUSH BEATING

This is a manner of stud ing all the insects, fies, spiders and other organisms which mainl reside in the hidden branches of bushes and small trees and shrubs. Man organisms, mostl the buterfies and insects, take refuge inside these plants either for protecton, or for pre s. A careful stud of these organisms gives us a vivid idea on the faunal diversit of that place.

Requirements:

1. Umbrella
2. Stck/Staf
3. 70% Eth l Alcohol
4. Air-tght Containers
5. Sterile Gloves
6. Tape

Methodology

All the bushes and small trees around the place were shaken vigorousl and beaten with a stck, one at a tme, while simultaneousl spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, ma be trapped immediatel in the umbrella.

The insects were then stored in air tght containers containing 70% eth l alcohol to maintain their tssue integrit and serve as a conservatve.

STUDENTS CARRYING OUT BUSH BEATING

PITFALL

Pitfall-traps: For Soil-surface-actve Invertebrates.

Pitfall traps were used to surve populatons of invertebrates actve at the soil surface (afer Luf, 1996) and consisted of 6 cm diameter plastc cups, sunk in the ground with the cup-lip level with the soil surface.

There are man variatons of pitfall traps, but in its most basic form, a pitfall trap consists of some t pe of cup or other container (gallon bucket, for example) that is submerged in the soil and partall flled with a preservatve. Insects and other organisms crawling about on the ground simpl walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overfowing the cup, the can have guide vanes that ma help guide organisms into the cup, and the ma be baited to capture more specifc t pes of insects.

Requirements

While carr ing out Pitfall Trapping

1. Containers
2. Soap water
3. 70% Eth l Alcohol
4. Forceps
5. Sterile Gloves
6. Sugar

Methodology

For the Pitfall traps, four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efcient capture of the surface invertebrates. Following wa s were emplo ed:

- Sugar was scatered around the entre circumference of the containers to atract ants and other insect.
- Soap water was poured into the containers to make the surface slipper and thereb ensuring the avoidance of escape atempts b the captured insect.

FIG: PITFALL TRAP

STUDENTS CARRYING OUT PITFALL.

STUDY OF QUADRATE

Principle:-

When an ecologist wants to know how man organizatons there are in a partcular habitat, it would not be feasible to count them all. Instead he would be forced to count a smaller representatve part of the populaton called sample. Sampling of plants & animals that don't move much (such as snails) can be done b using sampling square called quadrate. A suitable size of quadrate depends upon size of the organisms being sampled. For example to count plants growing on college campus one could use a quadrate with size 0.5 to 1 meter in length.

Materials & methods of insects collection:-

1. Small garden gloves
2. Forceps
3. A kill jar containing 70% alchol
4. Insect pins
5. Ziploc packets & plastc container
6. Labels
7. Strings
8. Wood poles
9. Magnif ing glass
10. Newspaper for collecton

Methodology

A suitable site was selected for quadrate work to be done. An area of 1sq was measured & the region was demarcated with the help of string. The string was fxed in square form 1meter*1meter & the corners were fxed with wood poles. Thus the quadrate was formed & various species of fora & fauna were collected with the help of forceps.

STUDENTS CARRYING OUT QUADRATE STUDY

FIG: INSECTS FOUND IN BUSH BEATINGs PITFALL AND QUADRATE STUDY

TIGER AS A KEYSTONE SPECIES

- A ke stone species is a plant or animal that pla s a unique and crucial role in the wa an ecos stem functons. Without ke stone species, the ecos stem would be dramatcall diferent or cease to exist altogether. A ke stone species is ofen, but not alwa s, a predator.

- Tiger is an important ke stone species in a terrestrial ecos stem. Tiger as apex species can regulate species abundance, diversit , distributon; which in turn can impact the health of terrestrial habitats.

- Additonall the provide essental food sources for the grazers and remove the sick and weak from populaton of pre species.

- The decimaton of these tger species can have cascading efects throughout the ecos stem the inhabit, resultng in economicall and ecologicall devastatng consequences.

- In India's Kanha Natonal Park, the ke stone species is Tiger and the jewel has been described as "barasinha".

- Tiger is the largest of the world's great cats. Barasinha, gaur, sambar, chital, nilgai help to maintain wildlife populaton.

PUG MARKING

Pug marking is the term used to refer to the footprint of most animals (speciall mega fauna). "Pug" means foot in Hindi (Sanskrit –*Padh*; Greek –*Ped*. Ever individual animal species has a diferent pugmark and as such it is used for identfcaton.

- **IMPORTANCE OF PUGMARK:**

- Wildlife conservatonists are known to catalogue pugmarks in the areas the operate.

- Pugmarks are also for tracking rogue animals which ma be a danger to mankind or even to themselves because of injuries, etc.
- It is possible to make an accurate identfcaton of species, sex, age and ph sical conditon of an animal b those trained in the feld.

- **TO MAKE A PLASTER CAST:**

 MATERIALS:

- Plaster of Paris (medical qualit)
- Water
- A mug to prepare paste
- A strip of thick paper or fexible aluminium.

ACKNOWLEDGEMENT

I would like to express m special thanks of grattude to our Principal ma'am Dr. Arpita Mukerji & Vice principal sir Dr. Supratm Das as well as our respected professors Dr. Swagata Chatopadh a , Dr. Nara an Chandra Das, Dr. Samrat Bhatachar a, Dr. Partha Pal, Dr. Aniruddha Chaterjee, Dr. Malini kundu and our lab assistant Sri Sunil kr Pramanik who gave us the golden opportunit to do this wonderful feld report , which also helped us in doing a lot of Research and enlightened us with a lot of knowledge about our subject and animal behavior. Secondl l would also like to thank m classmates who helped me in fnalizing this report within the limited tme frame. Without the help it wouldn't have been possible to complete the feld report of our memorable excursion to Tadoba-andhari tger reserve.

.....

Signature of teacher

UNIVERSITY OF CALCUTTA

B.Sc. Honours in Zoology Semester-V Examination-2020

(Under C.B.C.S.)

PAPER- CC 11

FIELD WORK ASSESSMENT

ECOSYSTEM AND ITS BIODIVERSITY ASSESSMENT

NAME: AVIPSHA MONDAL

COLLEGE ROLL NUMBER: 18S-709

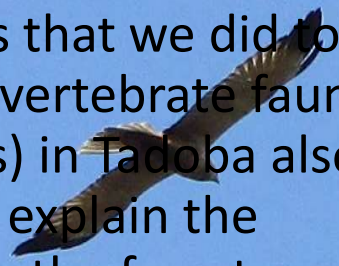
ROLL NUMBER: 183223-11-0110

REGISTRATION NUMBER: 223-1211-0443-18

INDEX

ABSTRACT

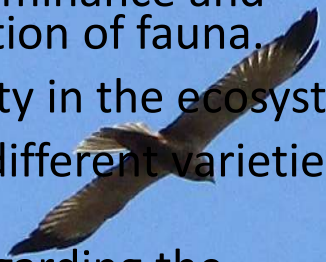
This project on “ECOSYSTEM AND ITS BIODIVERSITY ASSESSMENT ” prepared, encompasses the description of various ecosystems present in the Tadoba Andheri Tiger Reserve (Chandrapur, Maharashtra, India), Bor Tiger Reserve (Manoli, Maharashtra). It also contains an account of the diverse flora and fauna that are found there. An attempt has been made herein to present an idea about the different kinds of animals present in their distribution. The number of individuals of different species of animals as observed during the jungle safaris have been recorded and presented. The use of Shannon Weiner’s Biodiversity Indices has been used to explain the dominance and richness of the species that were observed during the safaris. Apart from that, an account of the activities that we did to study the diversity of invertebrate fauna (particularly arthropods) in Tadoba also has been presented. To explain the population of animals in the forest ecosystem (a rough idea) the use of numerous pie chart have been made.



OBJECTIVE

The objectives for this project on “ECOSYSTEM AND ITS BIODIVERSITY ASSESSMENT” are as follows

- ✓ To have an idea about the structure and functioning of the ecosystem.
- ✓To gain knowledge about the biodiversity in general.
- ✓To examine the varieties of ecosystems and biodiversity found conservation areas.
- ✓To understand how different species of animals interact with the environment and components.
- ✓To have an idea about the different kinds of habitats and ecosystems present in the protected places we went to.
- ✓To have knowledge about different species of animals found in the national parks and sanctuaries.
- ✓To study the diversity pattern of fauna.
- ✓To understand faunal dominance and evenness in the distribution of fauna.
- ✓To predict the uncertainty in the ecosystem.
- ✓To learn to identify the different varieties of fauna.
- ✓To build a knowledge regarding the correlation of ecosystem and biodiversity.



ECOSYSTEM- BRIEF INTRODUCTION

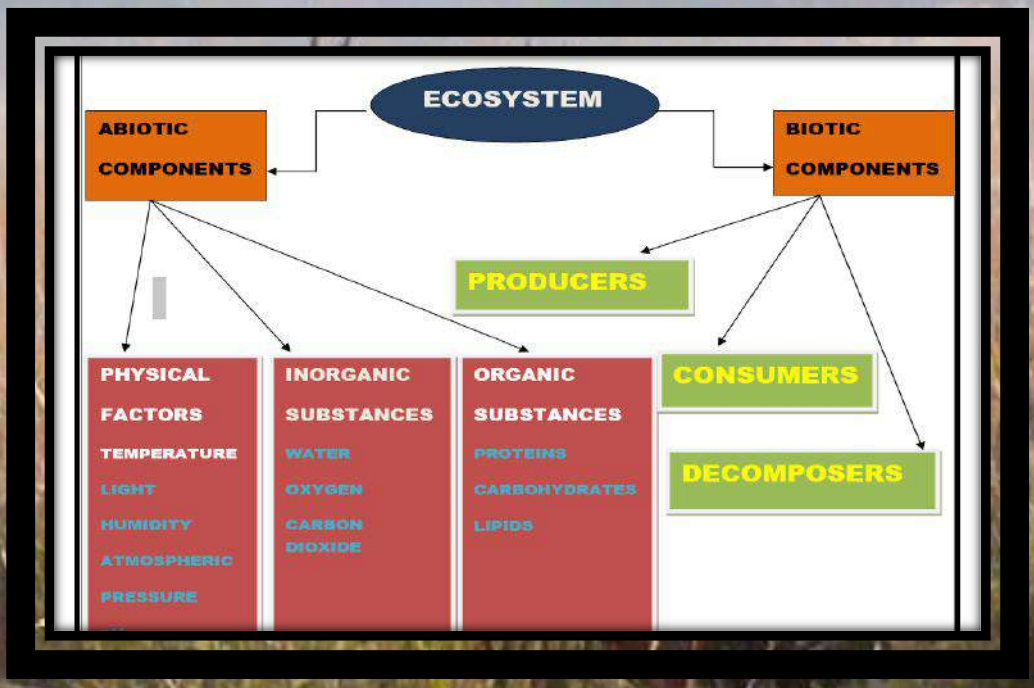
- The word ‘ecosystem’ was coined by A.G.Tansley in 1935.
- According to Eugene.P.Odum (1983), “Any unit that includes all the organisms that functions together in a given area interacting with the physical environment so that a flow of energy leads to clearly defined biotic structures and non living parts is an ecological system or ecosystem.”

Lake ecosystem

Ecosystem is the largest functional unit of ecology.

COMPONENTS OF AN ECOSYSTEM

According to E.P.Odum, the components of an ecosystem are



A flowchart of Ecosystem

TERRESTRIAL ECOSYSTEMS

FOREST ECOSYSTEM:

Forests have community of plants having trees, shrubs, herbs and climbers. Forest trees show random growth they do not grow in rows as observed in plantation by man. In a natural forest, trees grow in communities such as Teak- *Terminalia* community or *Zizyphus* acacia community. Wild animals are very important part of forest ecosystem.

- **GRASSLAND ECOSYSTEM:**

- A grassland ecosystem is a collection of plants, animals and microorganisms that live in an environment where grasses are the primary sources of vegetation.

- **AQUATIC ECOSYSTEMS**

- Types of Aquatic Ecosystems:

1. **Lentic System:** It refers to stationary or relatively still water. Lentic water is considered to be present in ponds, lakes, and wetlands.
   - **Characteristics:**
   - ❖ There is a marked stability in the physicochemical properties of water.
   - ❖ There are thermal stratifications as well as that of oxygen and nutrients.
   - ❖ They are closed systems.
   - ❖ Light illuminates only the upper layers- the limnetic zone, where active photosynthesis and growth occurs which results in plenty of oxygen and rapid consumption of nutrients. Profundal and benthic zones are dark. Some oxygen also dissolves in the surface water from the atmosphere above.

Zonation:

❖ Littoral Zone: The zone around the margins of a water body which consists of shallow waters. Plenty of light is available and rooted plants can grow in this zone only.

❖ Limnetic Zone: It is the zone of open waters which are deeper as well. Available of plenty of light promotes active photosynthesis and growth of free floating autotrophs- the planktons.

❖ Profundal Zone: This zone occurs under the limnetic zone and receives very little light. Hence, it can be referred to as aphotic zone in contrast to euphotic zone. (limnetic and littoral), which are well illuminat The ed.

❖ Benthic zone: It lies under the Profundal zone, which is at the bottom region of the water body. Both profundal and benthic zones are characterized by the presence of heterotrophs which live on dead and decaying organic matter.

1. Lotic System:

They are those systems which contain flowing waters, the basic function of the lotic bodies of water is to carry the surplus rain water back to the sea.

Characteristics:

❖ There is a continuous unidirectional flow in a lotic ecosystem.

❖ Plenty of oxygen is derived from air above which is evenly distributed throughout the water mass. To this, is added the oxygen produced by the autotrophs. Oxygen depletion is therefore, rare in unpolluted lotic waters.

❖ Turbidity usually limits light penetration to deeper zones of lotic systems.

❖ The physiochemical properties of water are also in a state of perpetual change. Stratification and stagnation are altogether absent.

Zonation:

According to illies and Botosaneanu (1963), two major subdivisions have been recognized:

- ❖ Ritthorn Zone: It is the steep and torrential upper course. It is also called Rapid Zone. It is characterized by steep, narrow, shallow and turbulent rifles or rapids.
- ❖ Potamon Zone: It is the flat slow running lower course. It is also called the Pool Zone. It is the flatter, wider and deeper pool.

As a part of our project on ECOSYSTEM ASSESSMENT, we conducted studies on the Forest and Aquatic ecosystems, assessing the various abiotic and biotic components of it.

BIODIVERSITY-BRIEF INTRODUCTION

DEFINITION

The term Biodiversity was popularized by socio-biologist Edward Wilson to describe the combined diversity or heterogeneity at all the levels of biological organization right from macromolecules within the cells, genes, species, ecosystems and biomes.

TYPES OF BIODIVERSITY

1. GENETIC DIVERSITY:

Genetic Diversity is a measure of variety in genetic information contained in the organisms. Within a species, genetic diversity occurs in the differences of alleles, entire genes and chromosomal structures. More than 50000 genetically different strains of rice and 1000 varieties of mango occur in India due to genetic variations.

2. SPECIES DIVERSITY:

It refers to the variety of species within a region. For example, Western Ghats have greater amphibian diversity as compared to Eastern Ghats.

3. ECOLOGICAL DIVERSITY:

It is the variety of ecosystems which indicate diversity in the number of niches, trophic levels, food webs, nutrient cycles and ecological processes sustaining energy flow. For example, ecosystem diversity is high in India because of the occurrence of a large number of ecosystems.

LEVELS OF BIODIVERSITY

1. ALPHA DIVERSITY:

It refers to the diversity within a particular area or ecosystems and is usually expressed by the number of species in that ecosystem.

2. BETA DIVERSITY:

It refers to the diversity of species between two separate ecosystems.

3. GAMMA DIVERSITY:

It is a measure of the overall diversity for the different ecosystems present in a community.

HOW MANY SPECIES ON EARTH AND HOW MANY IN INDIA?

According to the International Union of Conservation Of Nature and Natural Resources (IUCN, 2004), the total number of plant and animal species described so far is slightly more than 1.5 million, but there is no clear idea of how many species are yet to be discovered and described.

1. Number of animal species is more than 70%. Plants (including algae, fungi, bryophytes, gymnosperms, and Angiosperms) account for nearly 22% of the total.

2. Among animals, insects are the most species-rich taxonomic group, making more than 70% of the total, out of every 10 animals on this plant, 7 are insect.

3. Number of fungi species (72000) in the world is more than the combined total of the species of fishes (28000), amphibians (4780), reptiles (7150) and mammals (4650).

PROCESS AND SIGNIFICANCE:

The approach to studying biodiversity is a complete process, as one has to take into account a number of variables like where biodiversity is, how it is changing over space and time, the drivers responsible for such change, the consequences of such change for ecosystem services and human well being and response options available. In spite of many tools and data sources, biodiversity remains difficult to quantify precisely.

We did the biodiversity assessment of the Tadoba National Park and Bor Tiger Reserve. and the data has been presented in this report.

TOUR ITINERARY

- 23rd February,2020: Left Howrah station by train, Gitanjali express (12860) at 1:40 PM for Nagpur.
- 24th February,2020: Reached Nagpur at morning. Transport to Tadoba. Stayed overnight at Tadoba
- 25th February,2020: Educational fieldwork throughout the day. Stayed overnight at Tadoba.
- 26th February,2020: Set off for Bor in the morning. Stayed overnight at Bor.
- 27th February,2020: Educational fieldwork throughout the day. Stayed overnight at Bor.
- 28th February,2020: set off for Nagpur at early morning to board train, Azad Hind Express (12129) at 10:10 AM.
- 29th February,2020: Reached Howrah by noon.

ACCOMODATION:

1. Tadoba Andhari Tiger Reserve government rest house.

2. Bor Tiger Reserve government cottage

ACCOMPANIED BY:

1. Prof. Swagata Chattapadhyay
2. Sri. Sunil Kumar Pramanik

THE GROUP PHOTO OF THE ZOOLOGY HONOURS STUDENTS ALONG WITH THE TEACHER IN-CHARGE FOR THE EXCURSION

MATERIALS AND METHODS

In order to study the ecosystem and Biodiversity of the two National park and Sanctuary we went to the following activities are performed.

- Assessment of Abiotic Components
- Assessment of Biotic Components

❑ASSESSMENT OF ABIOTIC COMPONENTS

➢Measurement of air temperature :

A laboratory thermometer graduated in Centigrade scale (Celsius scale) was used for the purpose. The thermometer was held in mid air and the temperature was recorded.

➢Measurement of pH of soil sample:

50 gram of soil sample was taken in a Petri-dish and 10ml of water was added to it. Such that the soil was partially wet. A pH paper was taken and it was dipped in the soil sample mixed with water and the pH value was recorded.

MATERIALS AND METHODS

ASSESMENT OF BIOTIC COMPONENTS

➢SAFARI:

Jungle Safari can also be defined as a forest trail, except that instead of walking, hiking, one can also get the option of exploring the forest regions via jeep or an Elephant or a Horse. The Jungle Safari not only involves exploring a particular region of a jungle but also National Parks and Wildlife Sanctuaries as well as protective reserves.

We need to carry Binoculars (Olympus), Cameras (Canon IXUS 185 digital camera, Canon EOS 3000D digital Camera), notepad and pens for the purpose. The forest tourist guides and our teacher professor Swagata Chattopadhyay helped us to identify the various fauna we observed. Also used literature sources like “BIRDS OF THE INDIAN SUBCONTINENT” by Richard Grimmett for identification of many Birds. We recorded the names, number of individuals seen and also photographed them. These details were used to calculate the diversity indices.

MATERIALS AND METHODS

➢ PITFALL TRAPS

- Pitfall trapping is a sampling technique which is widely used in studies of seasonal occurrence, to examine spatial distribution patterns, to compare relative abundance in different micro-habitats, to study daily activity rhythms, and in community surveys, of various organisms.

➢ STRUCTURE AND COMPOSITION:

Pitfall traps come in a variety of sizes and designs. They come in two main forms; Dry and wet pitfall traps. Dry pitfall traps consists of a container the ground with its rim at surface level use to trap mobile animals that fall into it. Wet pitfall traps are basically the same but contain a solution designed to kill and preserve the trapped animals. The fluids used in these traps are formalin (10% formaldehyde), methylated spirits, alcohol, Ethelene glycol, trisodium phosphate, picric acid, or even plain water. A little amount of detergent is added to break the surface tension of the liquid to promote quick drowning. The opening is usually cover with a lid. This is done to reduce the amount of rain and debris entering the trap and to prevent animals in dry traps from drowning or over heating as well as to keep out predators. Traps may also be baited. Baits of varying specificity can be used to increase the capture rate of a target species or group by placing them in above or near the trap. Examples of baits includes meat, dung, fruit , sugar and pheromons.

MATERIALS AND METHODS

- **APPARATUS USED**
- ➢ **Small garden shovels**
- ➢ **Measuring tape**
- ➢ **Spatula**
- ➢ **Small equal sized containers for in-situ organism trapping**
- ➢ **Soap/Detergent water**
- ➢ **Edible sugar to lure the organisms into the traps**
- ➢ **Forceps**
- ➢ **Blotting paper**
- ➢ **Ethanol**
- ➢ **Measuring cylinder**
- ➢ **Distilled water**
- ➢ **Large container for storage of organisms collected**

MATERIALS AND METHODS

PROCEDURE

- For the collection of invertebrate specimens, wet pitfall traps are advisable. The wet pitfall traps we used consisted of a small plastic container set in a cavity dug into the earth. The container contained soap water for partial immobilization of invertebrate organisms that happened to topple into it. 4 such containers each of equal size were set one at each corner of a square of side 1 m and 1 container placed in Centre of the square. The traps were left as such for 24 hours for collection of organisms.

- The organisms thus collected were then removed from the soap water and soaked on a blotting paper. Then they were placed in 70% ethanol taken in another container for preservation. The invertebrate specimens thus collected generally consisted of a diversity of ants, spiders etc. Our teachers Professor Swagata Chattopadhyay helped us to identify the organisms collected. We also used literature sources like “Introduction To The Study Of Insects”, Borror and DeLong and the number of individuals of each type of organism was recorded and the data was obtained was used to calculate the Biodiversity Indices of organisms. Also, the organisms collected were photographed under an electronic magnifier.

MATERIALS AND METHODS

➢USES:

❖PITFALL TRAPS CAN BE USED FOR VARIOUS PURPOSES:

- Collectors and researchers of various ground dwelling Arthropod species may use pitfall traps to collect the animals they are interested in. This can be done with or without bait.
- When used in series these traps may also be used to estimate species richness and abundances and this combined information may be used to calculate biodiversity indices.

➢PROBLEMS:

There are inevitably biases in pitfall sampling when it comes to comparison of different group of animals and different habitats in which the trapping occurs. An animal's trap ability depends on the structure of it's habitat. Gullan and Cranston (2005) recommend measuring and controlling for such variations. Intrinsic properties of the animals itself also effect it's trap ability some taxa are more active than others, more likely to avoid the trap, less likely to be found on the ground or too large to be trapped.

MATERIALS AND METHODS

NOTE: The death of the huge number of Biological Entities, who sacrificed their lives as we executed our project by pitfall trap technique, who had an equal say in determining the biodiversity coefficient of the area, is highly regretted

Measurement of the corners of the square of length 1m

Digging small pits in the earth for the containers to fit in

Containers arranged on the corners of the square for pitfall trap

MATERIALS AND METHODS

➢ QUADRAT:

❖PRINCIPLE:

When an ecologist wants to know how many organisms there are in a particular habitat, it would not be feasible to count them all. Instead , he or she would be forced to count a smaller representative part of the population, called a sample. Sampling of plants or animals that do not move much (such as snails), can be done using a sampling square called quadrat. A suitable size of quadrat depends on the size of the organisms being sampled. For example, to count plants growing on a school field, one could use a quadrat with sides 0.5 or 1 meter in length.

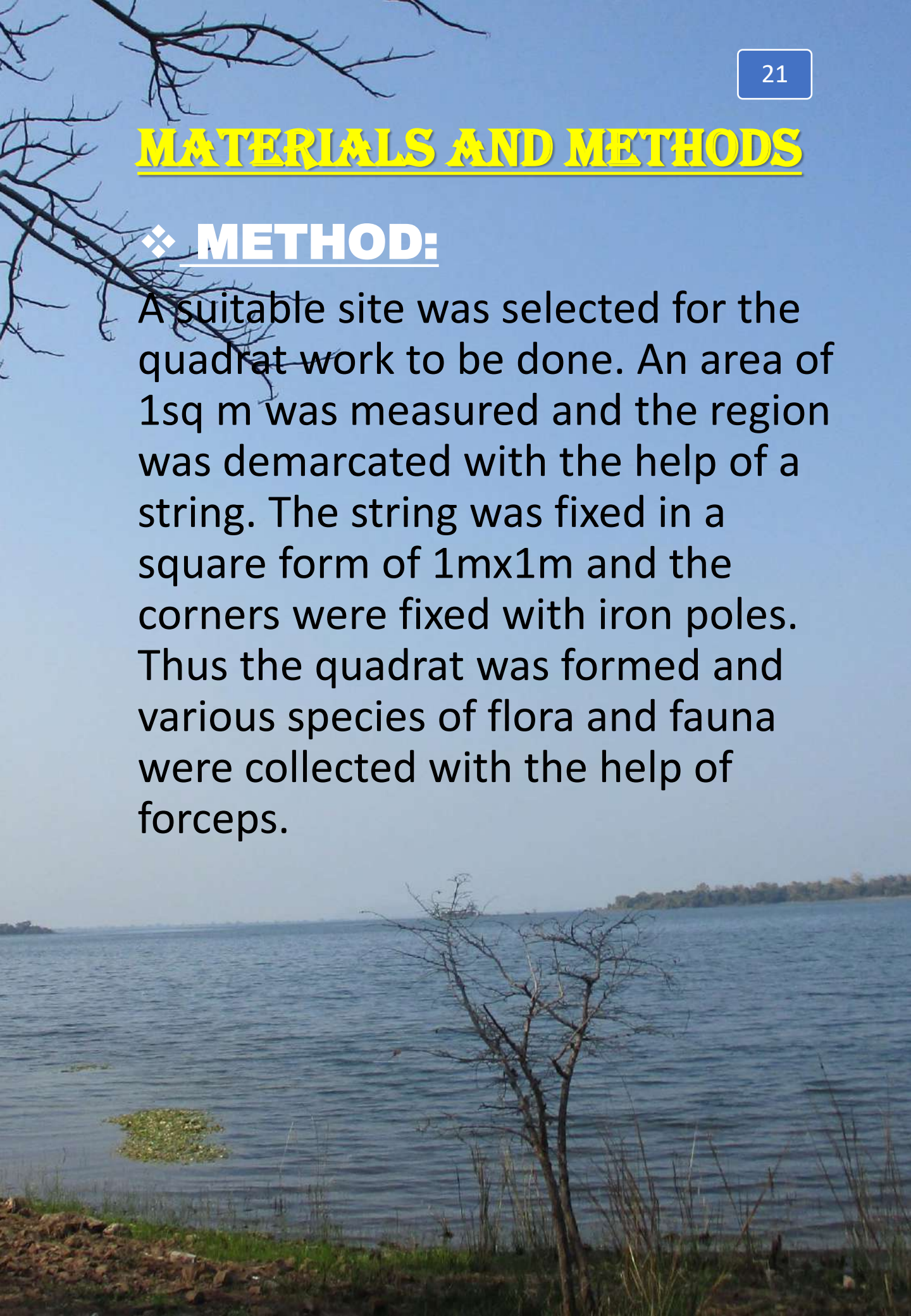
❖APPARATUS USED:

1. Small garden shovels.
2. Forceps
3. Measuring tape
4. Insect pins
5. A kill jar container 70% alcohol
6. Ziplock packets and plastic containers
7. Labels
8. Iron poles
9. String
10. Magnifying glass
11. Newspaper for collection

MATERIALS AND METHODS

❖ METHOD:

A suitable site was selected for the quadrat work to be done. An area of 1sq m was measured and the region was demarcated with the help of a string. The string was fixed in a square form of 1mx1m and the corners were fixed with iron poles. Thus the quadrat was formed and various species of flora and fauna were collected with the help of forceps.



DIVERSITY INDEX

- INTRODUCTION:

A diversity index is a mathematical measure of species diversity in a community. Diversity indices provide more information about community composition than simply species richness. They also take the relative abundance of different species into account. When diversity indices are used in ecology the types of interest are usually species, they can also be other categories, such as genera, families, functional types or haplotypes.

- TYPES:

Many kinds of diversity indices can be used to study a community diversity. We have used the Shannon- Weiner index.

- IMPORTANCE:

Diversity indices provide important information about rarity and commonness of species in a community. The ability to quantify diversity in this way is an important tool for biologists trying to understand community structure

- # SOME IMPOTANT TERMINOLOGIES

  - SPECIES RICHNESS:

  Species richness is the number of different species represented in an ecological community, landscape or region. It is simply a count of species, and it does not take into account the abundances of the species or the relative abundance distribution.

  - SPECIES EVENNESS:

  It refers to how close in numbers each species in an environment is.

  - SPECIES DOMINANCE:

  It gives an idea about the species whose population is highest In the community.

❑ SHANNON – WEINER INDEX:

It was proposed by Claude Shannon,1948. it is a measure of uncertainty. It was brought into ecology by Robert Mac Arthur. It has no unit. It is only meaningful when we compare it that of some other ecosystem. The idea behind this index is that the diversity of a community is similar to the amount of information in a code or massage. It is calculated in the following way :

$$H' = -\sum pi \ln pi$$

Where pi is the proportion of individuals found in species ı . For a well sampled community we can estimate this proportion as pi values will be between 0 and 1, natural log makes all of the terms of the summation negative, which is why we take the inverse of the sum.

INTERPRETATION:

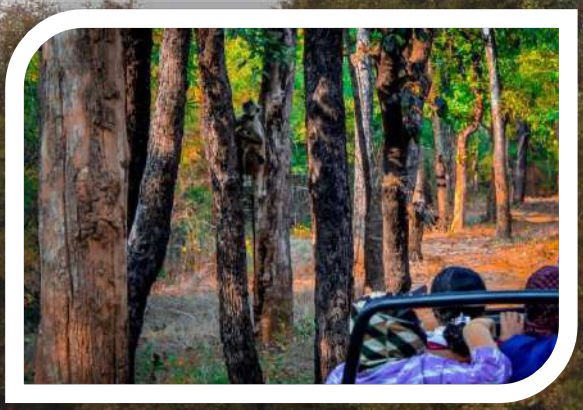
Typical values are generally between 1.5 and 3.5 in most ecological studies, and the index is rarely greater than 4. The Shannon- Weiner index. Increases as both the richness and the evenness of the community increase. The fact that the index incorporates bot components of biodiversity can be seen as both strength and weakness. It is a strength because it provides a simple, synthetic summery, but it is a weakness as it makes it difficult to compare communities that differ greatly in richness.

Higher the value of Shannon- Weiner index greater is the uncertainty. Lower the Shannon- Weiner index more is the dominance. For calculation of species evenness(J) we use the formula,

$$J = H' / \ln S$$

Where S is the total number of species in the community.

TADOBA ANDHARI TIGER RESERVE



DATE OF ARRIVAL: 24TH February ,2020
TIME OF ARRIVAL: 1:00 pm
EVENTS: 1. Morning safari
2. Evening safari
3. Field work
DATE OF DEPARTURE: 26th February, 2020
TIME OF DEPARTURE: 9:00 am

Group picture clicked at Tadoba

Picture of morning safari

HIGHLIGHTS

The Tiger Reserve is situated in the core area of the forest.

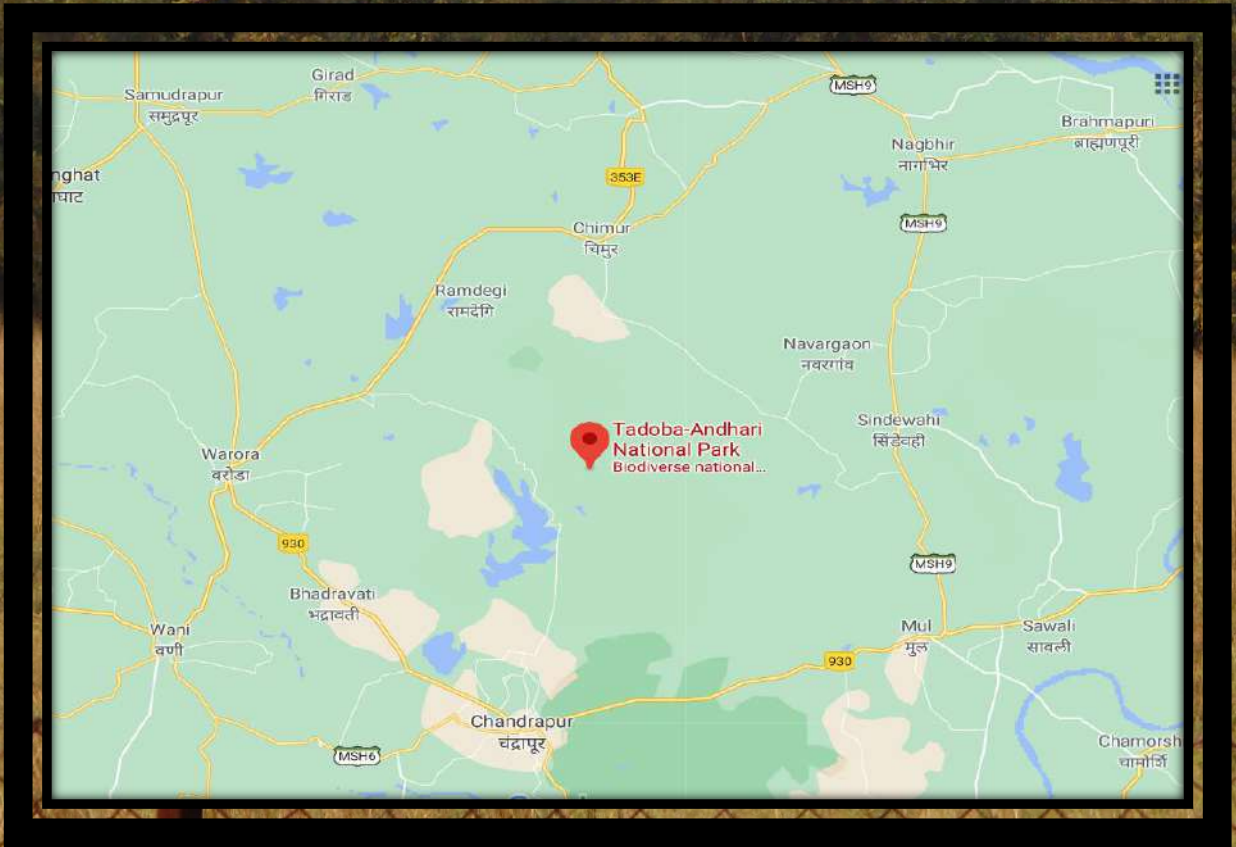
- **LOCATION:** Chandrapur, Maharashtra, India.
- One of the largest and oldest National Park.
- February to May is the best time to visit.
- **SEASONS:** Summer (February to July with temperature 30◦ - 47◦ C.

  Monsoon (mid June to October)

  Winter (November to the end of January with minimum temperature of 9◦ C.
- **RAINFALL:** 1175 mm annually slight rain also occurs in October/ November brought by North East wind.
- **WATER SOURCES: T**adoba river, Tadoba lake, Kolsa lake.

LOCATION

The area of the Tadoba Andhari Tiger Reserve falls in the 20◦ 25’ 50” – 20◦ 04’ 53” N latitude and 79◦ 33’ 34” East longitude. The entire area comes under the district of Chandrapur of Maharashtra state and involves Chandrapur, Bhadrawati, Chimur, Warora and Sindewani Tahsils. It has it’s offices at Tadoba. Tadoba lies 45 Km North of the district headquarter, Chandrapur and about 200 Km, from the other main city, Nagpur. The other fair weather motorable road stations are Chandrapur and Warora on the central railway. The nearest airport is Nagpur. Terrain of Tadoba Andhari Tiger Reserve is undulating with gently rolling hills covered with dry deciduous forest.



HOW TO REACH TO TADOBA

Nagpur can be reached from New Delhi 125 hours flight service. Flight services ply between major metros and Nagpur.

Nagpur is connected with all major cities of India by rail. State buses ply to various destinations while luxury buses are available for travel to Jabalpur in Madhya Pradesh.

Nagpur to Mohurli gate – 180 Km via Chandrapur.

Nagpur to Kuswanda gate – 140 Km via Chandrapur.

Nagpur to Kolara gate - 120 Km via Chandrapur.

Nagpur to Navegaon gate – 140 Km via Chandrapur.

Nagpur to Pangdi gate – 250 Km via Chandrapur.

Nagpur to Zari gate – 190 Km via Chandrapur.

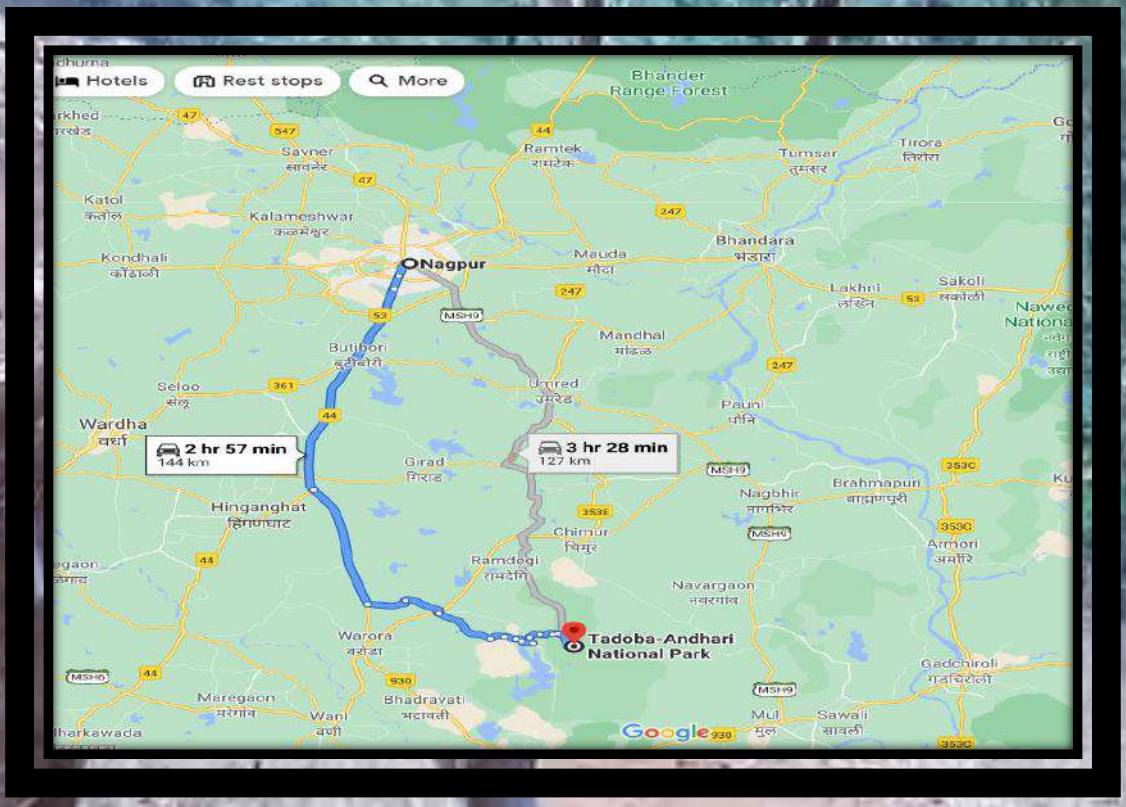
From Jabalpur to Nagpur – 280 Km.

Nagpur to Chandrapur – 100 Km.

Pench to Nagpur – 80 Km.

GATES TO TADOBA

1. Moharli gate
2. Kuswanda gate
3. Kolara gate
4. Navegaon gate
5. Pangdi gate
6. Zari gate



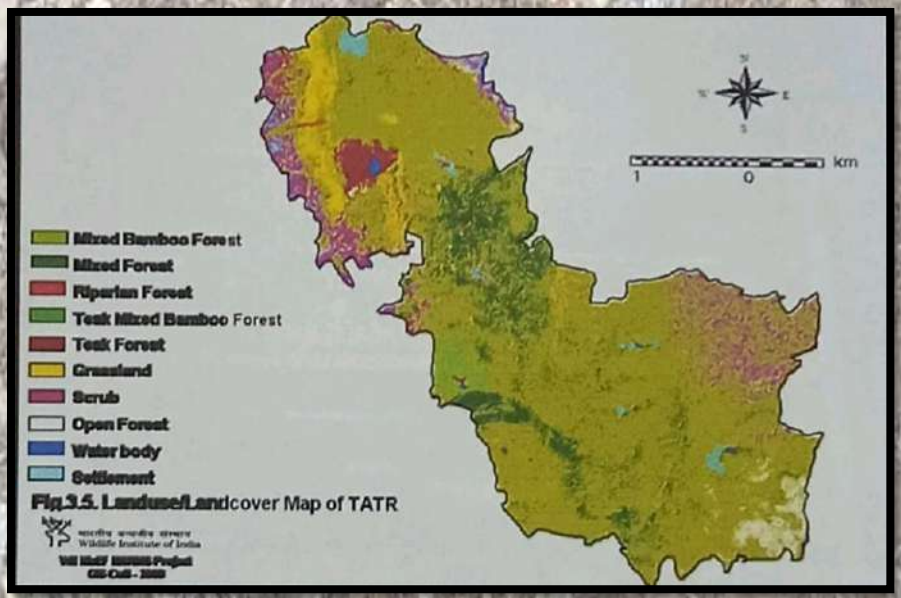
Road map from Nagpur city to Tadoba National Park

GEOLOGICAL DIVERSITY

Vindhyan sand stones occur in almost all of the area which consists of sandstones, shales and lime stone. The shale is intercalated with limestone. The prominent rocks are the grained vitreous sandstone. Broad geological divisions can be made for Tadoba Andhari Tiger Reserve based on the disposition of the rock types. In North, a small patch of detrital mantle consists of alluvial deposits.

In South Western site the Gondwana sediments expose Kamathi formation and Lamteas at surface. Archaean metamorphic rocks as patches are present along the north east corner and in the Western border. The soil in the greater part is sandy with stretches of yellow brown and black loam.

The black cotton soil is found in the plains except where the forest are heavily degraded. On the slopes the soil layer is thin and vegetation is sparse. The tops of the hillocks are mostly barren with exposed rocks.



Geological diversity map of Tadoba Andhari Tiger Reserve

A picture of bird watching tower in Tadoba

DRAINAGE AND WATER BODIES IN TADOBA

Tadoba is gifted with the centrally located magnificent 120 hectare, perennial natural water body. Tall and evergreen Jamun trees border this large reservoir and provide good nesting sites for a variety of birds. A good road runs along the periphery of this lake offering and excellent opportunity for ornithologist and wildlife observers. The rest houses in Tadoba are located in the Eastern bank of this graceful water body.

Andhari is the main river in the area. It originates from Pandharpauni in the Tadoba National Park and flows Southwards to join the river Wainganga. The portion of this river towards the South of Dewada-Kolsa road is perennial, whereas during it's course between Jamin and Dewad-Kolsa retain waters at pockets, which are termed "Dohs". Bhhanukundi nalla originates from Katezari in the Tadoba National Park and joins Erai river.

In addition to this streams and rivers as many as 10 large water tanks are available in the protected area, which are permanent water source. These tanks help in maintaining the water in pockets of downstream through seepage.

Besides these 7 more water tanks are available to quench the thirst. In spite of these water sources water remains scarce commodity particularly hot months of the year. Several water troughs especially constructed for use of wildlife have to be regularly filled in artificially. A tank of moderate size is also available at joining the rest house at Kolsa.

Tadoba Lake

PHOTOS OF THE JUNGLE

Site 1 (Junona zone)

Site 2 (Junona zone)

Site 3 (Agarzari zone)

Site 4 (Agarzari zone)

ECOSYSTEM

We observed the following various kinds of ecosystems in the Tadoba Andhari Tiger Reserve:

1. FOREST ECOSYSTEM:

Site 1(Junona zone)

Site 2(Agarzari zone)

2. GRASSLAND ECOSYSTEM:

Site 1(Junona zone)

Site 2(Agarzari zone)

3. AQUATIC ECOSYSTEM:

Site 1(Agarzari zone)

Site 2(Agarzari zone)

ENVIRONMENTAL ANALYSIS

➢MEASUREMENT OF AIR TEMPERATURE:

- **Date : 24.02.2020 – 26.02.2020**
- **Temperature at 6:45 pm: 17.5◦C**
- **Temperature at 8.45 am: 23◦C**

➢MEASUREMENT OF PH OF SOIL SAMPLE:

- **The soil collected from the area where we set the pitfall traps was used for PH analysis.**
- **Date of measurement: 26.02.2020 – 27.02.2020**
- **PH value: 7.3**

➢ COMMENTS:

Temperature are found to be moderate. The soil of the forested area was found to be alkaline. This indicates that the area has mostly clay soil with poor structure and low infiltration capacity. The soil has a low concentration of micronutrients.

FLORA OF TADOBA-ANDHARI TIGER RESERVE

Teak, Ain, Bija, Haldi, Dhaoda, Bamboo, Haldu, Arjun, Tendu, Salai, Jamun, Semal, Beheda, hirda Karayagum and Lanneacoramandelica (Wodier tree), Black Plum trees, etc are found in Tadoba-Andhari Tiger Reserve.

ZOOLOGICAL DIVERSITY

- The Tadoba Andhari Tiger Reserve is very rich in faunal diversity. Among the many kinds of organisms found in Tadoba some are listed below as follows.

BIRDS

Serial no.	Common Name	Scientific Name
1.	Grey Jungle Fowl	*Gallus sonneratii*
2.	House Sparrow	*Passer domesticus*
3.	Spotted Dove	*Spilopelia chinensis*
4.	Black Drongo	*Dircurus macrocercus*
5.	Little egret	*Egretta garzetta*
6.	Rufous treepie	*Dendrocitta vagabunda*
7.	Jungle babbler	*Turdoides striata*
8.	Crested serpent eagle	*Spilornis cheela*
9.	Red vented bulbul	*Pycnonotus cafer*
10.	Common starling	*Sturnus vulgaris*
11.	Shikra	*Accipiter badius*
12.	Black headed ibis	*Threskiornis melanocephalus*

Serial no.	Common Name	Scientific Name
13.	White throated kingfisher	*Halcyon smyrnensis*
14.	Indian spot bill duck	*Anas poecilorhyncha*
15.	Green bee eater	*Merops orientalis*
16.	Little grebe	*Tachybaptus ruficollis*
17.	Open billed stork	*Anastomus oscitans*
18.	Cotton pygmy goose	*Nattapus coromandelianus*
19.	Bronze winged jacana	*Metopidius indicus*
20.	Red wattled lapwing	*Vanellus indicus*
21.	Grey heron	*Ardea cinerea*
22.	Indian cormorants	*Phalacrocorax fuscicollis*
23.	whistling duck	*Dendrocygna sp.*
24.	Lesser adjutant stork	*Leptoptilos javanicus*
25.	Grey headed fish eagle	*Ichthyophaga ichthyaetus*
26.	Glossy ibis	*Plegadis falcinellus*
27.	Yellow footed green pigeon	*Treron phoenicoptera*
28.	Peafowl	*Pavo cristatus*
29.	Peahen	*Pavo cristatus*
30.	Indian roller	*Curacias benghalensis*
31.	Magpie robin	*Copsychus saularis*
32.	Euresian thick knee	*Burhinus oedicnemus*
33.	Grey hornbill	*Ocyceros birostris*

MAMMALS

Serial no.	Common Name	Scientific Name
1.	Spotted deer	*Axis axis*
2.	Indian gaur	*Bos gaurus*
3.	Grey langur	*Semnopithecus sp.*
4.	Sloth bear	*Melursus ursinus*
5.	Tiger	*Panthera tigris*
6.	Wolf	*Canis lupus*
7.	Jackal	*Canis aureus*
8.	Wild dog	*Cuon alpines*
9.	Fox	*Vulpes sp.*
10.	Hyena	*Hyaena hyaena*
11.	Sambar deer	*Rusa unicolor*
12.	Wild boar	*Sus scrofa*
13.	Blue bull	*Boselaphus tragocamelus*
14.	Porcupine	*Hystrx indica*
15.	Rhesus macaque	*Macaca mulatta*
16.	Leopard	*Panthera pardus*
17.	Jungle cat	*Felis chaus*
18.	Rusty spotted cat	*Prionilurus rubiginiosus*
19.	Indian pangolin	*Manis sp.*
20.	Four horned antelope	*Tetracerus quadricornis*
21.	Barking deer	*Muntiacus muntjak*

TIGER AS A KEY STONE SPECIES

- A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether. A keystone species is often but not always a predator.
- Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex predator can regulate species abundance, distribution, diversity; which in turn can impact the health of terrestrial habitats.
- Additionally they provide essential food sources for the grazers and remove the sick and weak from population of prey species.
- The decimation of these important tiger species can have cascading effects throughout the ecosystem they inhabit, resulting in economically and ecologically devastating consequences.
- In Tadoba National Park the keystone species is Tiger.
- Tiger is the largest of the world's great cat. Tiger, gaur, sambar deer, chital deer, blue bull help to maintain wildlife population.

PUG MARKING

Pug mark is the term used to refer the footprint of most animals. “Pug” means foot in Hindi. Every individual animal species has a distinct pug marks used for identification of different species.

Importance of pug marks:

A. Wildlife conversationists are known to catalogue pug marks in the area they operate.
B. Pug marks are also used for tracking rogue animals which may be in danger to mankind or even to themselves because of injuries etc.
C. It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the fields.

Tigress Madhuri

Pug marks of tiger

JUNGLE SAFARIES AND FIELDWORK FOR BIODIVERSITY ASSESSMENT

We did two jungle safaris as well as field work activities such as pitfall traps in Tadoba National Park in order to have a clear idea of its bio diversity. We went for the first safari on the morning of 25th February,2020 which started at 6:00 am and ended at 10:00 am.

We went for the second safari in the afternoon of 25th February,2020 which started at 2:00 pm and ended at 6:00 pm.

We set the pitfall traps in the evening of 24th February,2020 at about 3:00pm in the Junona zone of the reserve which in itself is an ecotone area. The traps were collected after 24 hours that is, the morning of 26th February,2020 at about 7:00 am.

The data collected from all these activities has been presented in the next pages in the form of a census report.

Pictures of us taken during the morning safari

1. MORNING SAFARI

- **Date :25.02.2020**
- **Zone : Junona zone**
- **Started at: 6:00 am**
- **Ended at: 10:00 am**

Pictures taken just outside the Junona zone gate

We went on the morning safari in a gypsy to the Tadoba Andhari Tiger reserve. The fauna observed and their corresponding number was recorded as follows.

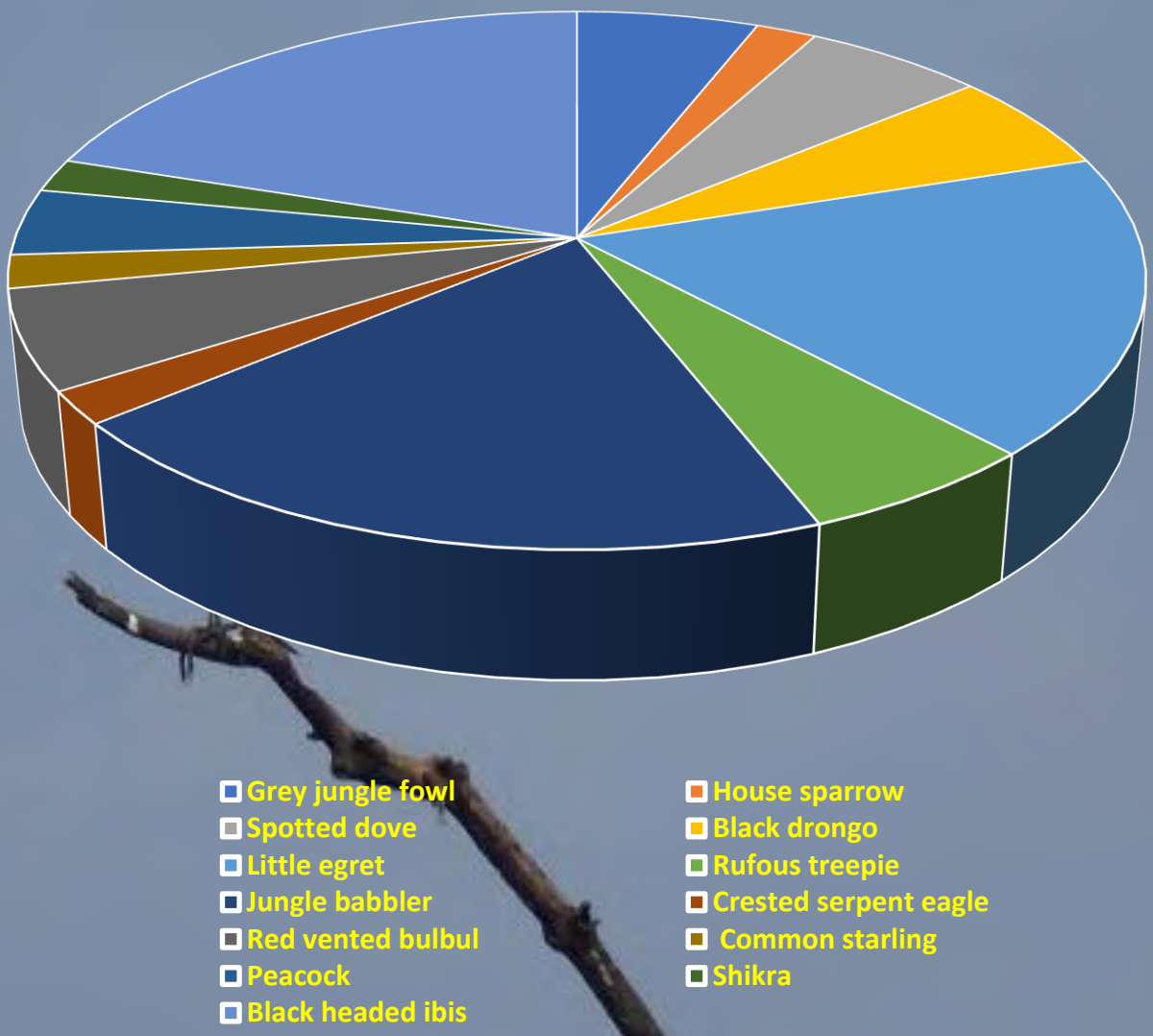
Serial number	Common Name	Scientific Name	Number of individual seen
1.	Spotted deer	*Axis axis*	17
2.	Grey jungle fowl	*Gallus sonneratii*	3
3.	House sparrow	*Passer domesticus*	1
4.	Indian gaur	*Bos gaurus*	23

Serial no.	Common Name	Scientific Name	Number of individuals seen
5.	Sotted dove	*Spilopelia chinensis*	3
6.	Black drongo	*Dircurus adsimillis*	3
7.	Little egret	*Egretta garzetta*	9
8.	Rufous treepie	*Dendrocitta vagabunda*	3
9.	Jungle babbler	*Turdoides striata*	10
10.	Crested serpent eagle	*Spilonnis cheela*	1
11.	Red vented bulbul	*Pycnonotus cafer*	3
12.	Common starling	*Sturnus vulgaris*	1
13.	Peacock	*Pavo cristatus*	2
14.	Grey langur	*Semnopithecus sp.*	1
15.	Shikra	*Accipiter badius*	1
16.	Black headed ibis	*Threskiornis melanocephalus*	10
17.	tigress	*Panthera tigris*	3

CHART REPRESENTATION OF BIODIVERSITY

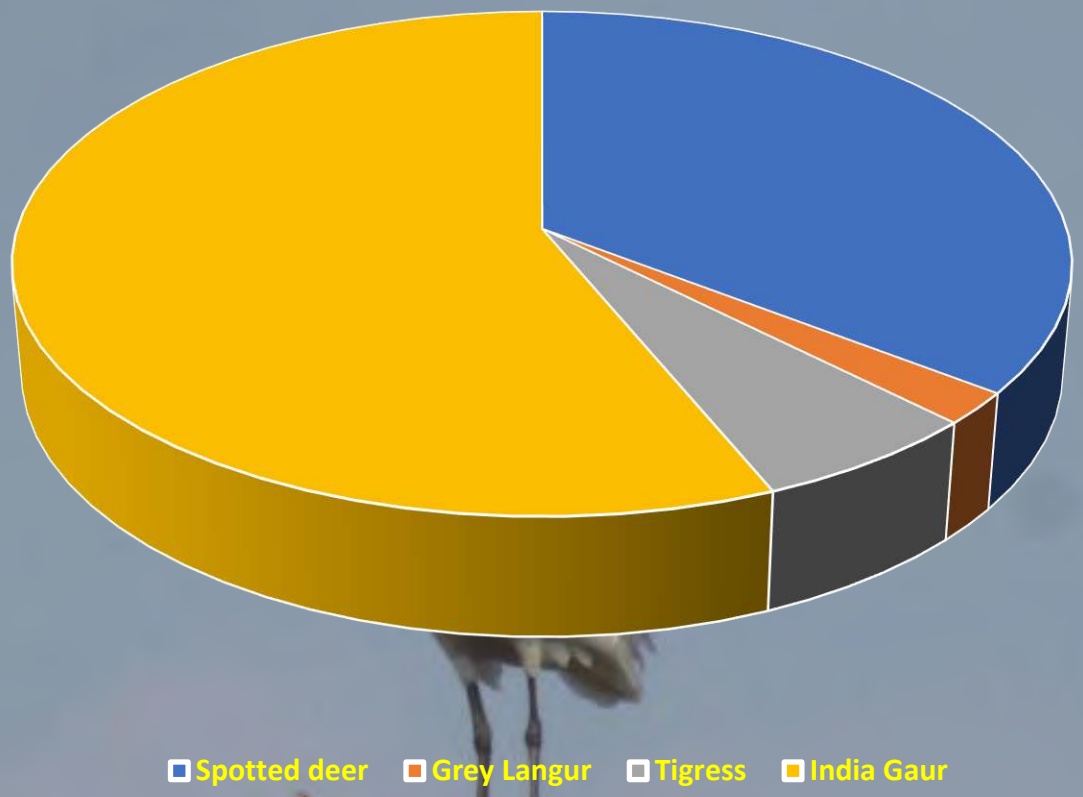
Based on the above data the fauna observed has been statistically represented as under:

Avian Fauna in Junona Zone



On the basis of the Pie chart drawn for avian fauna we conclude that the dominant species are Jungle babbler and Black headed Ibis each represented by 10 individuals.

Mammalian Fauna in Junona Zone



On the basis of the Pie Chart drawn for mammalian fauna we conclude that the dominant species is Indian Gaur represented by 23 individuals.

2. AFTERNOON SAFARI

- **Date:25th February 2020**
- **Zone: Agarzari zone**
- **Started at: 2:00pm**
- **Ended at: 6:00pm**

Picture taken before entering the Agarzari zone

Group picture clicked during Afternoon safari

We went on the afternoon safari in a gypsy to the Tadoba Andhari Tiger Reserve. The fauna observed and their corresponding number was recorded as follows.

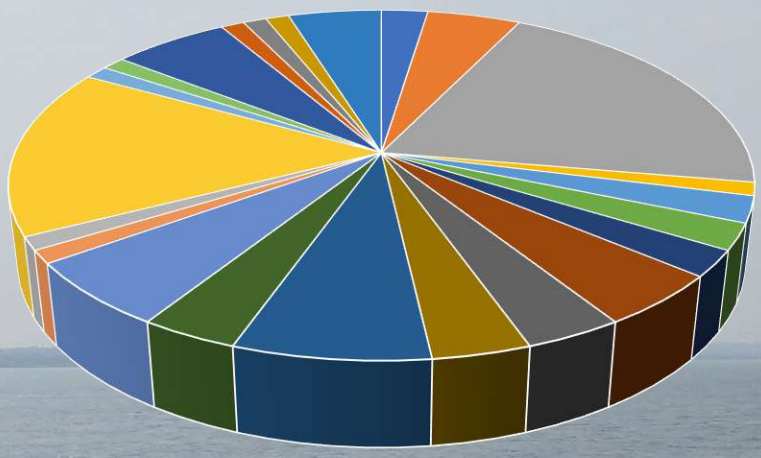
Serial No.	Common Name	Scientific Name	No. of individuals count
1.	White throated kingfisher	*Halcyon smynenois*	2
2.	Indian Spot billed Duck	*Anas poecilorhyncha*	2
3.	Whistling duck	*Dendrocygna* sp.	17
4.	Green bee eater	*Meros orientalis*	1

Serial No.	Common Name	Scientific Name	No. of individuals count
5.	Black drongo	*Dircurus adsimillis*	3
6.	Little grebe	*Tachybaptus ruficollis*	4
7.	Grey hornbill	*Ocyceros birostris*	2
8.	Yellow footed green pigeon	*Teron phoenicoptera*	2
9.	Red Vented Bulbul	*Pycnontus cafer*	3
10.	Open billed stork	*Anastomus oscitans*	6
11.	Grey Jungle Fowl	*Gallus sonnerattii*	3
12.	Grey Langur	*Semnopithecus sp.*	3
13.	Cotton pygmy goose	*Nettapus coromandelianus*	1
14.	Spotted deer	*Axis axis*	19
15.	Indian roller	*Coracias benghalensis*	3
16.	Indian Gaur	*Bos gaurus*	6
17.	Cattle egret	*Bubulcus ibis*	2
18.	Bronze winged jacana	*Metopidius indicus*	1
19.	Euresian thick knee	*Burhinus oedicnemus*	5
20.	Rufous treepie	*Dendrocitta vagabunda*	1
21.	Black headed ibis	*Pseudibis papillosa*	1
22.	Grey heron	*Ardea cinerea*	1
23.	Red wattled lapwing	*Vanellus indicus*	1
24.	Indian cormorants	*Phalacrocorax fuscicollis*	11
25.	Indian Pea fowl	*Pavo cristatus*	13

Serial no.	Common name	Scientific name	Number of individuals seen
26.	Magpie robin	*Copsyshus saularis*	1
27.	Barking deer	*Muntiacus muntjac*	2
28.	Sambar deer	*Rusa unicolor*	3
29.	Wild boar	*Sus scrofa*	1
30.	Sloth beer	*Melursus ursinus*	5
31.	Tiger cub	*Panthera tigris*	1
32.	Glossy ibis	*Plegadis falcinellus*	1
33.	Rose ring parakeet	*Psittacula krameria*	4
34.	Lesser adjutant stork	*Leptoptilos javanicus*	1

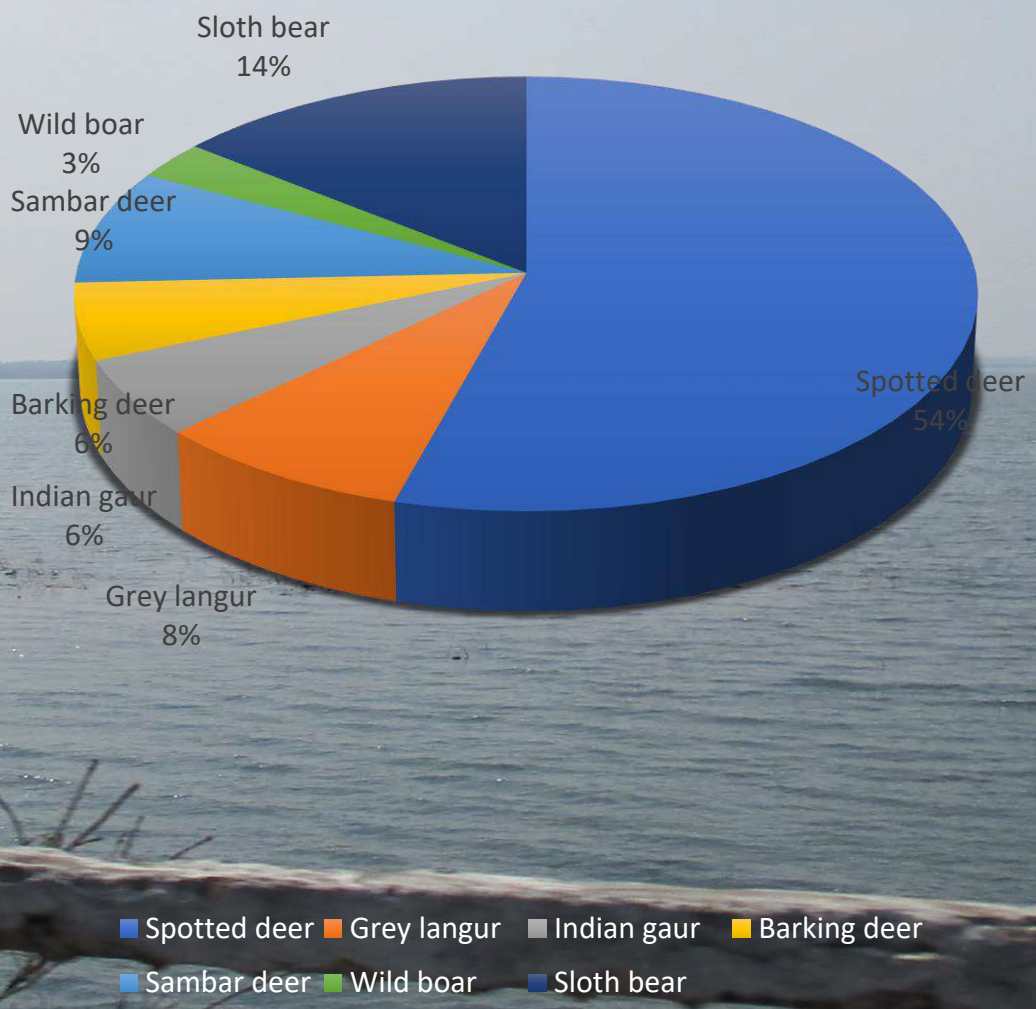
Based on the above data the fauna observed has been statistically represented as under:

Avian Fauna in Agarzari zone



On the basis of the pie chart drawn for Avian fauna we conclude that the dominant species is whistling duct with the individuals of 17

Mammalian Fauna in Agarzari Zone



On the basis of the pie chart drawn for Avian fauna we conclude that the dominant species is Spotted deer with the individuals of 19.

3. PITFALL TRAP

❖Setting the traps:

- Date: 24.02.2020
- Time: 4:00pm

❖Collecting the traps:

- Date : 26.02.2020
- Time: 7.00am

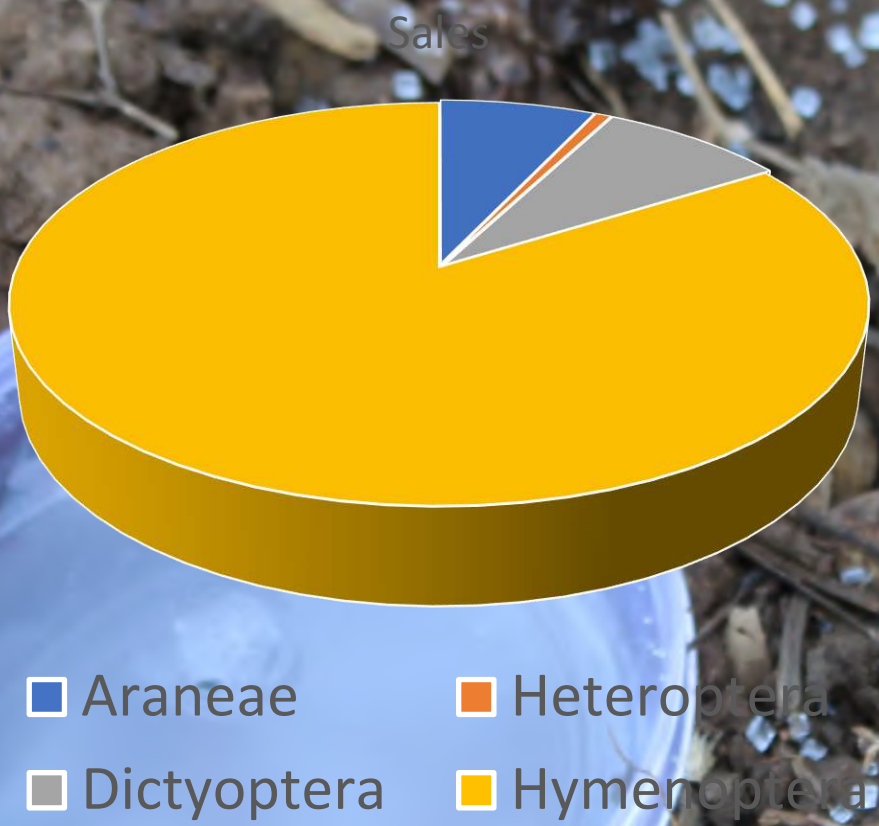



Making of pitfall traps

The different types of organisms collected in the pit fall trap technique were identified by us under the guidance of our professors and appropriate literature sources. The number of individuals belonging to different insect orders was recorded as follows:

Serial no.	Order	Number of individuals seen
1.	Araneae	10
2.	Heteroptera	10
3.	Dictyoptera	12
4.	Hymenoptera	120

INVERTIBRATE FAUNA



On the basis of the pie chart drawn for Invertebrate fauna we conclude that the dominant species is of order Hymenoptera represented by 120 individuals.

4. QUADRAT STUDY

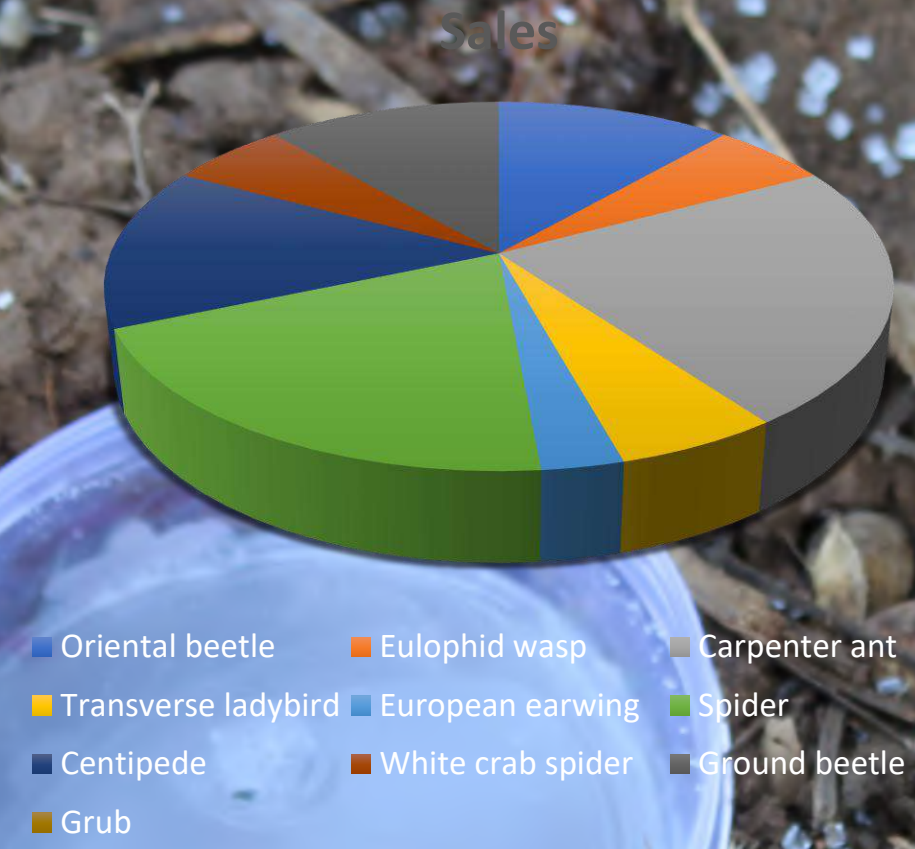
Date: 25.02.2020
Time: 11:00am

Collecting samples from quadrat

We did the quadrat study in Tadoba Andhari Tiger Reserve. The fauna observed and their corresponding number was recorded as follows.

Serial no.	Common name	Scientific name	Number of individuals seen
1.	Oriental beetle	*Anomela sp.*	4
2.	Eulophid wasp	*Chrysocharis sp.*	2
3.	Carpenter ant	*Camponotus sp.*	8
4.	Transverse ladybird	*Coccinella sp.*	2
5.	European earwing	*Forficula Auricularia*	1
6.	Spider(Family: Thomisidae)	*Araneae sp.*	7
7.	Centiped	*Pauropus sp.*	5
8.	White crab spider	*Thomius sp.*	2
9.	Ground beetle	*Calosoma sp.*	4
10.	Grub (larva of beetle)		5

Invertebrate Fauna



On the basis of the pie chart drawn for Invertebrate fauna we conclude that the dominant species is Carpenter ant with the individuals of 8

FAUNA OBSERVED IN SAFARI

Intermediate egret

Indian roller

Asian open billed stork

Black headed ibis

peafowl

Crested serpent eagle

Cotton pygmy goose

White eyed buzzard

Rose ring parakeet

Indian pond heron

Lesser egret

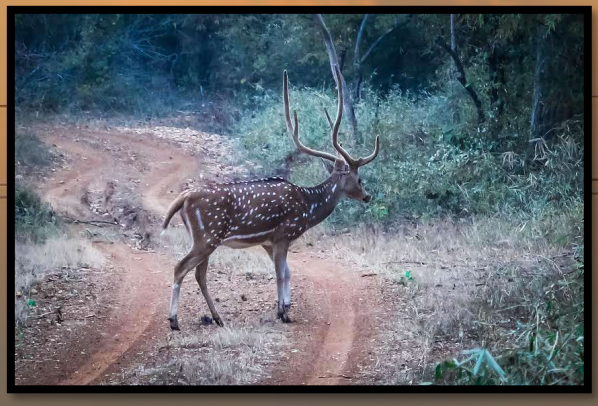
Yellow footed green pigeon

Indian gaur

Tigress

Grey langur

Tigress



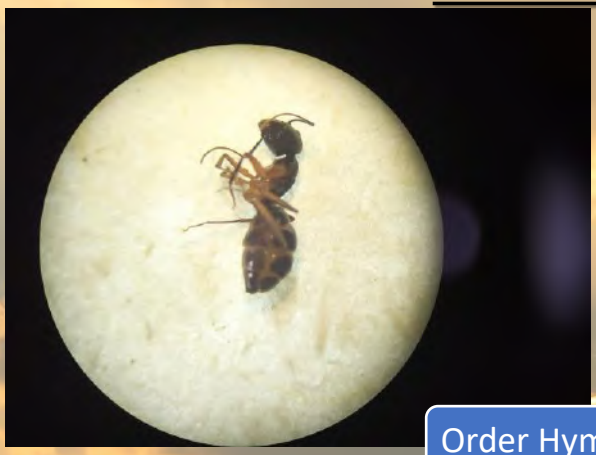
Spotted deer

Sambar deer(male and female)

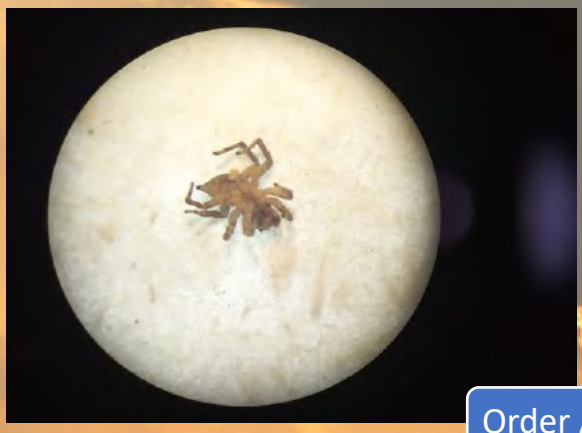
A Sloth bear in search of food

An Indian gaur(male) eating grass

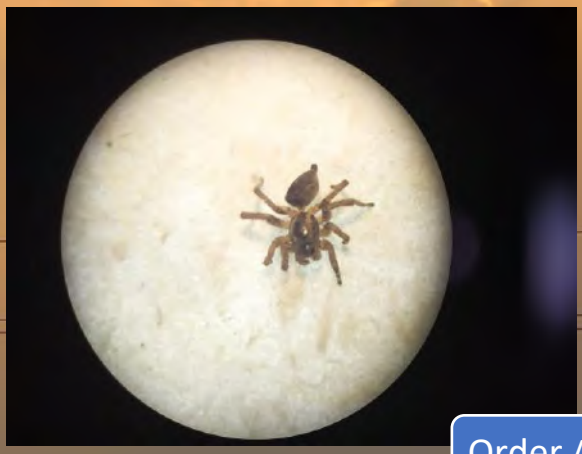
SOME INVERTEBRATE FAUNA OBSERVED



Order Hymenoptera



Order Aranea



Order Arnea

CALCULATION OF THE DIVERSITY INDEX

The data obtained about the distribution of different types of fauna was used to calculate the biodiversity indices.

CALCULATION FOR THE SHANNON WEINER INDEX

The Shannon Weiner index have been calculated for the fauna observed as a whole which means a single table has been prepared for the calculations which includes the animals seen in both morning and afternoon safaris

SAFARI

AVIAN FAUNA

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
1.	Grey Jungle Fowl	6	0.0379	-3.2728	-0.1240
2.	House Sparrow	1	0.0063	-5.0672	-0.0319
3.	Spotted Dove	3	0.0189	-3.9685	-0.0750
4.	Black Drongo	5	0.0316	-3.4545	-0.1091
5.	Little egret	16	0.1012	-2.2906	-0.2318
6.	Rufous treepie	4	0.0253	-3.6769	-0.0930
7.	Jungle babbler	14	0.0886	-2.4236	-0.2147
8.	Crested serpent eagle	1	0.0063	-5.0672	-0.0319
9.	Red vented bulbul	6	0.0379	-3.2728	-0.1240
10.	Common starling	1	0.0063	-5.0672	-0.0319
11.	Shikra	1	0.0063	-5.0672	-0.0319
12.	Black headed ibis	11	0.0696	-2.6649	-0.1854

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
13.	White throated kingfisher	2	0.0126	-4.3740	-0.0551
14.	Indian spot bill duck	2	0.0126	-4.3740	-0.0551
15.	Green bee eater	1	0.0063	-5.0672	-0.0319
16.	Little grebe	4	0.0253	-3.6769	-0.0930
17.	Open billed stork	6	0.0379	-3.2728	-0.1240
18.	Cotton pygmy goose	1	0.0063	-5.0672	-0.0319
19.	Bronze winged jacana	1	0.0063	-5.0672	-0.0319
20.	Red wattled lapwing	1	0.0063	-5.0672	-0.0319
21.	Grey heron	1	0.0063	-5.0672	-0.0319
22.	Indian cormorants	11	0.0696	-2.6649	-0.1854
23.	whistling duck	26	0.1645	-1.8048	-0.2968

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
23.	whistling duck	26	0.1645	-1.8048	-0.2968
24.	Lesser adjutant stork	1	0.0063	-5.0672	-0.0319
25.	Grey headed fish eagle	1	0.0063	-5.0672	-0.0319
26.	Glossy ibis	1	0.0063	-5.0672	-0.0319
27.	Yellow footed green pigeon	2	0.0126	-4.3740	-0.0551
28.	Peafowl	15	0.0949	-2.3549	0.2234
29.	Peahen	2	0.0126	-4.3740	-0.0551
30.	Indian roller	3	0.0189	-3.9685	-0.0750
31.	Magpie robin	1	0.0063	-5.0672	-0.0319
32.	Euresian thick knee	5	0.0316	-3.4545	-0.1091
33.	Grey hornbill	2	0.0126	-4.3740	-0.0551
	TOTAL	158			-3.2507

Here $\sum$pi x ln pi =-3.2507
Therefore, Shannon Weiner Index =-(-3.2507)=3.2507
Species Evennness, J= 3.2507/ln 33=0.9296

MAMMALIAN FAUNA

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
1.	Spotted deer	36	0.4285	-0.8474	-0.3631
2.	Indian gaur	29	0.3452	-1.0636	-0.3671
3.	Tiger	4	0.0476	-3.0449	-0.1451
4.	Grey langur	4	0.0476	-3.0499	-0.1451
5.	Sloth bear	5	0.0595	-2.8217	-0.1678
6.	Barking deer	2	0.0238	-3.7380	-0.0889
7.	Sambar deer	3	0.0357	-3.3326	-0.1189
8.	Wild boar	1	0.0119	-4.4312	0.0527
	TOTAL	84			-1.4487

Here $\sum pi \times \ln pi = -1.4487$

Therefore, Shannon Weiner Index $= -(-1.4487) = 1.4487$

Species Evennness, $J = 1.4487/\ln 8 = 0.6966$

Since the value of Shannon Weiner index is directly proportional to uncertainty we can predict that the uncertainty in the distribution of Avian fauna(having a higher value of 3.2507) is more than that of Mammalian ones(having lower value of 1.4487). However on the basis of values of species Evenness we can predict that Birds have more even distribution in ecosystem in comparision to Mammalian fauna.

PITFALL TRAP

INVERTEBRATE FAUNA

Serial no.	Order	ni	pi	ln pi	Pi x ln pi
1.	Araneae	10	0.0699	-2.6607	-0.1860
2.	Heteroptera	1	0.0070	-4.9618	-0.0347
3.	Dictyoptera	12	0.0839	-2.4781	-0.2079
4.	Hymenoptera	120	0.8392	-0.1753	-0.1471
	TOTAL	143			-0.5757

Here ∑pi x ln pi =-0.5757
Therefore, Shannon Weiner Index =-(-0.5757)=0.5757
Species Evennness, J= 0.5757/ln 4=0.4153

Since the value of Shannon Weiner Index is directly proportional to uncertainmty, we can predict that the uncertainty in the distribution of orders of organisms collected in pit fall trap is of lower value index i.e. 0.5757. We can also predict that Arthropod orders have an even distribution.

QUADRAT

INVERTEBRATE FAUNA

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
1.	Oriental beetle	4	0.1	-2.3025	-0.2302
2.	Eulophid wasp	2	0.005	-2.9957	-0.1497
3.	Carpenter ant	8	0.2	-1.6094	-0.3218
4.	Transverse ladybird	2	0.05	-2.9957	-0.1497
5.	European earwing	1	0.025	-3.6888	-0.0922
6.	Spider(Family: Thomisidae)	7	0.175	-1.7429	-0.3050
7.	Centiped	5	0.125	-2.0794	-0.2599
8.	White crab spider	2	0.05	-2.9957	-0.1497
9.	Ground beetle	4	0.1	-2.3025	-0.2302
10.	Grub (larva of beetle)	5	0.125	-2.0794	-0.2599
	TOTAL	40			-2.1483

Here ∑pi x ln pi =-2.1483
Therefore, Shannon Weiner Index =-(-2.1483)=2.1483
Species Evenness, J= 2.1483/ln 10=0.9330

Since the value of Shannon Weiner index is directly proportional to uncertainty we can predict that the uncertainty in the distribution of Invertebrate fauna was found to of higher value of 2.1483. However, the species evenness was found to have a higher value of 0.9330, so we can say that the invertebrate species are evenly distributed in the ecosystem.

BOR TIGER RESERVE

Date of arrival: 26.02.2020
Time of arrival: 1:00pm

Events : 1.Morning safari
2.Afternoon safari

Date of departure: 28.02.2020
time of departure: 6:00am

To the wilderness

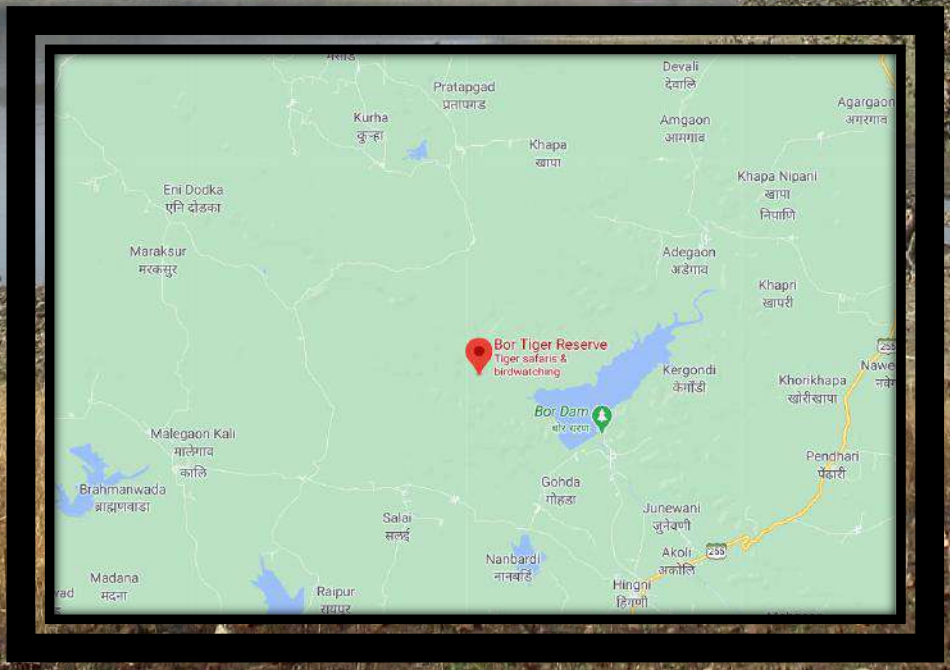
Picture clicked before going to morning safari

HIGHLIGHTS

- Bor Tiger Reserve is situated in the core area. It is the sixth tiger reserve of Maharashtra and smallest tiger reserve in India.
- February to may is the best time to visit.
- seasons:
  - summer (February to July with the temperature of 30-47°C)
  - Monsoon (Mid June to October)
  - winter (November to January with minimum temperature of 9°C)
- Best time to visit in April to May.
- Water resources: Bor dam

LOCATION

Bor Tiger Reserve is centrally located among several other Bengal tiger habitats including: Pench Tiger Reserve, Maharashtra, 90 km2 (35 sq mi) to the northeast; Nagzira Navegaon Tiger Reserve, 125 km2 (48 sq mi) to the east northeast; Umred Karhandla Wildlife Sanctuary, 75 km2 (29 sq mi) to the east southeast; Tadoba - Andhari Tiger Reserve, 85 km2 (33 sq mi) to the southeast; Melghat Tiger Reserve, 140 km2 (54 sq mi) to the west northwest and Satpura National Park and Tiger Reserve,160 km2 (62 sq mi) to the northwest.



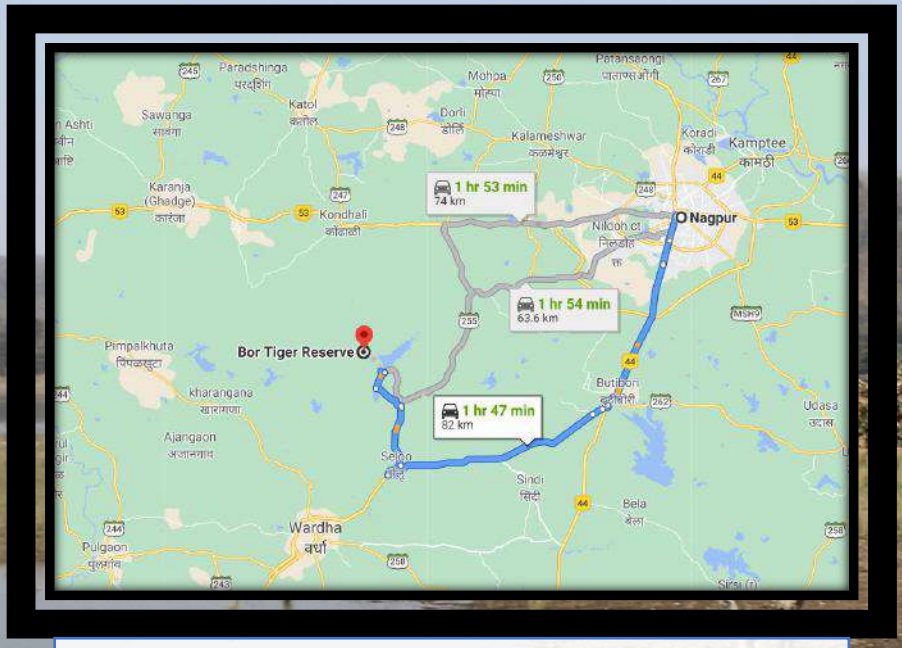
HOW TO REACH TO BOR

- To reach the Bor Tiger Reserve, one must go ahead on the Wardha-Nagpur road through MSH3 and turn North at Seloo for Hingni. From Hingni you can directly reach the visitor center at Bor Dam.

- By Air: Dr Babasaheb Ambedkar International Airport in Nagpur is closest to Bor Tiger Reserve. It is 80 km away from the sanctuary.

- By Railways: The nearest railhead, Wardha, is about 35 km away.

- By Road: The Hingni bus stand is at merely 5 km from the sanctuary. Buses arrive from and depart to Bor Wildlife Sanctuary frequently here.



Road map from Nagpur city to Bor Tiger Reserve

ZONES

- In April, 2012, the Maharashtra state government issued a notification adding 60 km2 (23 sq mi) to the old 61.1 km2 (23.6 sq mi) area of Bor Sanctuary. The new Core Zone of 115.92 km2 (44.76 sq mi) is the most protected and inviolate part of the sanctuary where the public is not allowed. It comprises 95.7% of the total area. Most of the core area is contiguous with good forest of Wardha Forest Division and Nagpur Forest Division.

- The Eco-tourism Zone of 5.21 km2 (2.01 sq mi) designated for public access for nature and wildlife tourism comprises 4.3% of the total sanctuary area. The purpose of the tourism zone is to educate the public about the significance of nature and wildlife conservation and to stimulate their environmental awareness.

- The Buffer Zone is less protected forest area near the sanctuary that serves as a protective barrier for the core area.

- The Bor Tiger Reserve is physically divided by the Bor Reservoir into 2 sections, previously; 2/3 (40 km2 (15 sq mi)), as the west part and 1/3 (21 km2 (8.1 sq mi)), as the eastern part. 95% of the western part is in Wardha district and 90% of the eastern part is in Nagpur district. The Bor Reservoir area is about 7.25 km2 (2.80 sq mi) and is not included in the total sanctuary area.

PICTURE OF ECOSYSTEMS

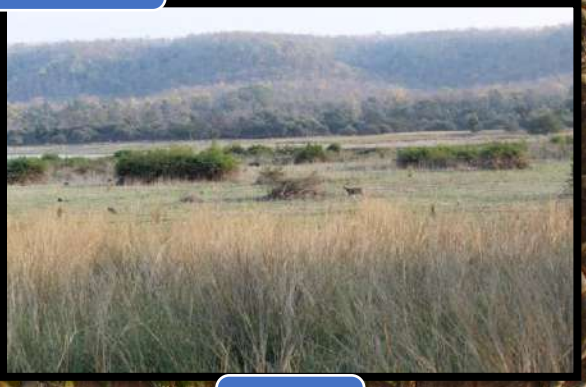
FOREST ECOSYSTEM

Site 1

Site 2

GRASSLAND ECOSYSTEM

Site 1



Site 2

AQUATIC ECOSYSTEM

Site 1

Site 2

ENVIRONMENTAL ANALYSIS

➢MEASUREMENT OF AIR TEMPERATURE:

Date : 27.02.2020

Temperature at 5:30 am: 17.2◦C

Temperature at 7.40 pm: 26.5◦C

➢MEASUREMENT OF PH OF SOIL SAMPLE:

The soil collected from the area where we stayed at night and the PH sample was analysed

Date of measurement: 27.02.2020

PH value: 7.8

➢ COMMENTS:

Temperature are found to be moderate. The soil of the forested area was found to be alkaline. This indicates that the area has mostly clay soil with poor structure and low infiltration capacity. The soil has a low concentration of micronutrients.

FLORA OF BOR TIGER RESERVE

The Bor Tiger Reserve is populated by Dry Deciduous Forest type. Teak, Tikur, Bamboo, Tarot, Gokhru are some of the abundant species.

ZOOLOGICAL DIVERSITY

- The Bor Tiger Reserve is very rich in faunal diversity. Among the many kinds of organisms found in Bor some are listed below as follows.

BIRDS

Serial no.	Common Name	Scientific Name
1.	Grey Jungle Fowl	*Gallus sonneratii*
2.	House Sparrow	*Passer domesticus*
3.	Spotted Dove	*Spilopelia chinensis*
4.	Black Drongo	*Dircurus macrocercus*
5.	Little egret	*Egretta garzetta*
6.	Rufous treepie	*Dendrocitta vagabunda*
7.	Jungle babbler	*Turdoides striata*
8.	Crested serpent eagle	*Spilornis cheela*
9.	Red vented bulbul	*Pycnonotus cafer*
10.	Common starling	*Sturnus vulgaris*
11.	Shikra	*Accipiter badius*
12.	Black headed ibis	*Threskiornis melanocephalus*

Serial no.	Common Name	Scientific Name
13.	White throated kingfisher	*Halcyon smyrnensis*
14.	Indian spot bill duck	*Anas poecilorhyncha*
15.	Green bee eater	*Merops orientalis*
16.	Little grebe	*Tachybaptus ruficollis*
17.	Open billed stork	*Anastomus oscitans*
18.	Cotton pygmy goose	*Nattapus coromandelianus*
19.	Bronze winged jacana	*Metopidius indicus*
20.	Red wattled lapwing	*Vanellus indicus*
21.	Grey heron	*Ardea cinerea*
22.	Indian cormorants	*Phalacrocorax fuscicollis*
23.	whistling duck	*Dendrocygna sp.*
24.	Lesser adjutant stork	*Leptoptilos javanicus*
25.	Grey headed fish eagle	*Ichthyophaga ichthyaetus*
26.	Glossy ibis	*Plegadis falcinellus*
27.	Yellow footed green pigeon	*Treron phoenicoptera*
28.	Peafowl	*Pavo cristatus*
29.	Peahen	*Pavo cristatus*
30.	Indian roller	*Curacias benghalensis*
31.	Magpie robin	*Copsychus saularis*
32.	Euresian thick knee	*Burhinus oedicnemus*
33.	Grey hornbill	*Ocyceros birostris*

Serial no.	Common Name	Scientific Name
34.	Paradise flycatcher	*Terpsiphone sp.*
35.	Flame winged parakeet	*Pyrrhura calliptera*
36.	Golden backed woodpecker	*Dinopium benghalense*
37.	Munia	*Lonchura sp.*

MAMMALS

Serial no.	Common Name	Scientific Name
1.	Spotted deer	*Axis axis*
2.	Indian gaur	*Bos gaurus*
3.	Grey langur	*Semnopithecus sp.*
4.	Sloth bear	*Melursus ursinus*
5.	Tiger	*Panthera tigris*
6.	Wolf	*Canis lupus*
7.	Jackal	*Canis aureus*
8.	Wild dog	*Cuon alpines*
9.	Fox	*Vulpes sp.*
10.	Hyena	*Hyaena hyaena*
11.	Sambar deer	*Rusa unicolor*
12.	Wild boar	*Sus scrofa*
13.	Blue bull	*Boselaphus tragocamelus*
14.	Porcupine	*Hystrx indica*
15.	Rhesus macaque	*Macaca mulatta*
16.	Leopard	*Panthera pardus*
17.	Jungle cat	*Felis chaus*
18.	Rusty spotted cat	*Prionilurus rubiginiosus*
19.	Indian pangolin	*Manis sp.*
20.	Four horned antelope	*Tetracerus quadricornis*
21.	Barking deer	*Muntiacus muntjak*

JUNGLE SAFARIES FOR BIODIVERSITY ASSESSMENT

We did two jungle safaris in Bor Tiger Reserve in order to have a clear idea of its bio diversity. We went for the first safari on the morning of 27th February,2020 which started at 7:00 am and ended at 10:00 am.

We went for the second safari in the afternoon of 27th February,2020 which started at 2:00 pm and ended at 5:30 pm.

The data collected from all these activities has been presented in the next pages in the form of a census report.

A group picture taken just outside the entry gate

1. MORNING SAFARI

- **Date :27.02.2020**
- **Zone : Bordharan zone**
- **Started at: 7:00 am**
- **Ended at: 10:00 am**

Pictures taken during the morning safari

We went on the morning safari in a gypsy to the Bor Tiger reserve. The fauna observed and their corresponding number was recorded as follows.

Serial number	Common Name	Scientific Name	Number of individual seen
1.	Spotted deer	*Axis axis*	23
2.	Grey jungle fowl	*Gallus sonneratii*	4
3.	Munia	*Lonchura sp.*	2
4.	Blue bull	*Boselaphus tragocamelus*	1

Serial no.	Common Name	Scientific Name	Number of individuals seen
5.	Sotted dove	*Spilopelia chinensis*	1
6.	Black drongo	*Dircurus adsimillis*	2
7.	Rose ring parakeet	*Psittacula krameri*	4
8.	Indian roller	*Coracias benghalensis*	6
9.	Jungle babbler	*Turdoides striata*	4
10.	Crested serpent eagle	*Spilonnis cheela*	1
11.	Indian pond heron	*Ardeola grayii*	2
12.	Indian cormorants	*Phalacrocorax carbo*	1
13.	Peacock	*Pavo cristatus*	12
14.	Grey langur	*Semnopithecus sp.*	14
15.	Green bee eater	*Merops orientalis*	1
16.	Grey heron	*Ardea cinera*	1
17.	White eyed buzzard	*Butastur teesa*	1
18.	Yellow footed green pigeon	*Ternon sp.*	4
19.	Sambar deer	*Rusa unicolor*	37

2. AFTERNOON SAFARI

- **Date:27th February 2020**
- **Zone: Bordharan zone**
- **Started at: 2:00pm**
- **Ended at: 5:30pm**

picture of us clicked during Afternoon safari

Picture taken before entering the Bordharan zone

We went on the afternoon safari in a gypsy to the Bor Tiger Reserve. The fauna observed and their corresponding number was recorded as follows.

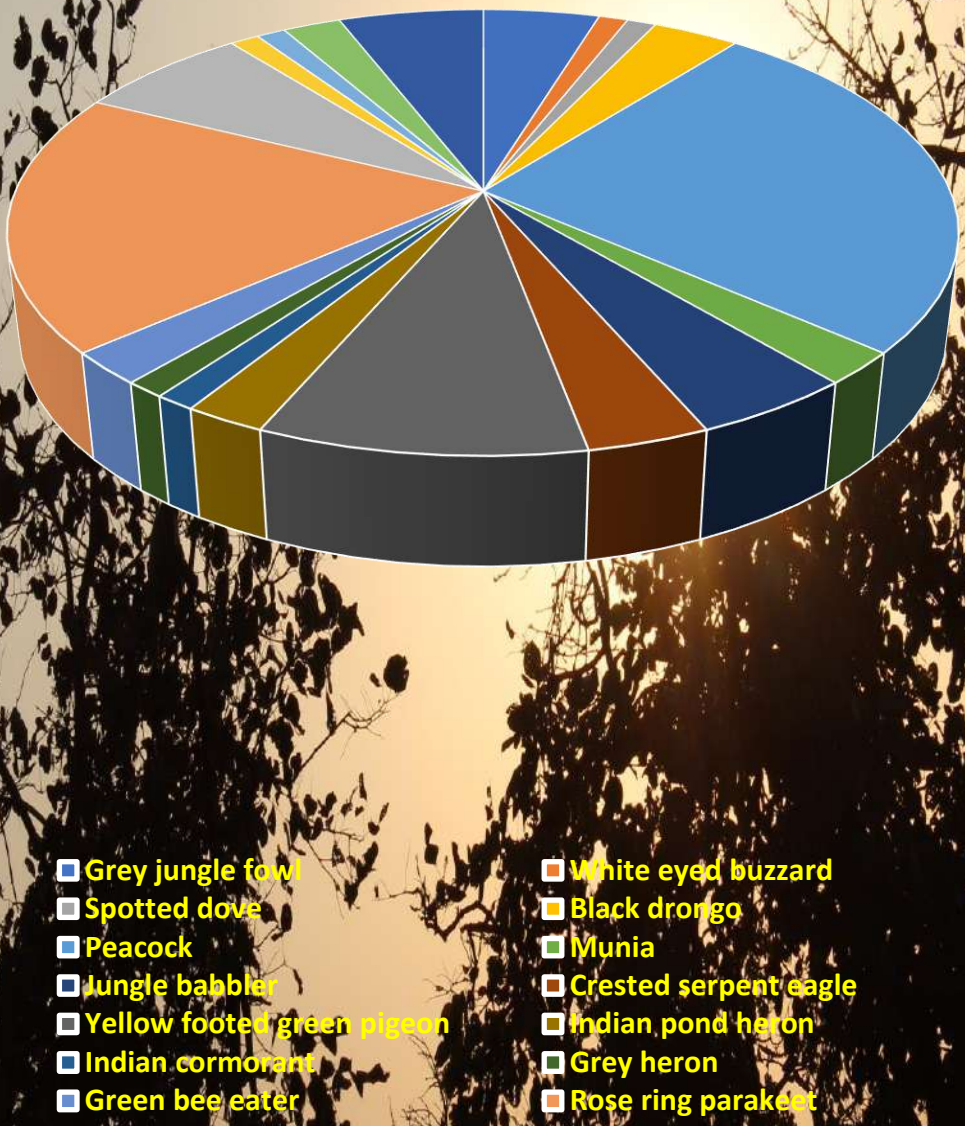
Serial No.	Common Name	Scientific Name	No. of individuals count
1.	Rose ring parakeet	*Psitacula krameri*	12
2.	Blue bull	*Boselaphus tragocamelus*	5
3.	Crested serpent eagle	*Spilornis cheela*	2
4.	Green bee eater	*Meros orientalis*	1

Serial No.	Common Name	Scientific Name	No. of individuals count
5.	Black drongo	*Dircurus adsimillis*	1
6.	Sambar deer	*Rusa unicolor*	20
7.	Wild boar	*Sus scrota*	1
8.	Yellow footed green pigeon	*Teron phoenicoptera*	4
9.	Golden back woodpecker	*Dinopium bhenghalense*	1
10.	Flame winged parakeet	*Pyrrhura calliptera*	1
11.	Grey Langur	*Semnopithecus sp.*	13
12.	Spotted deer	*Axis axis*	16
13.	Red wattled lapwing	*Vanellus indicus*	2
14.	Indian Peahen	*Pavo cristatus*	5
15.	Indian peafowl	*Pavo cristatus*	10

CHART REPRESENTATION OF BIODIVERSITY

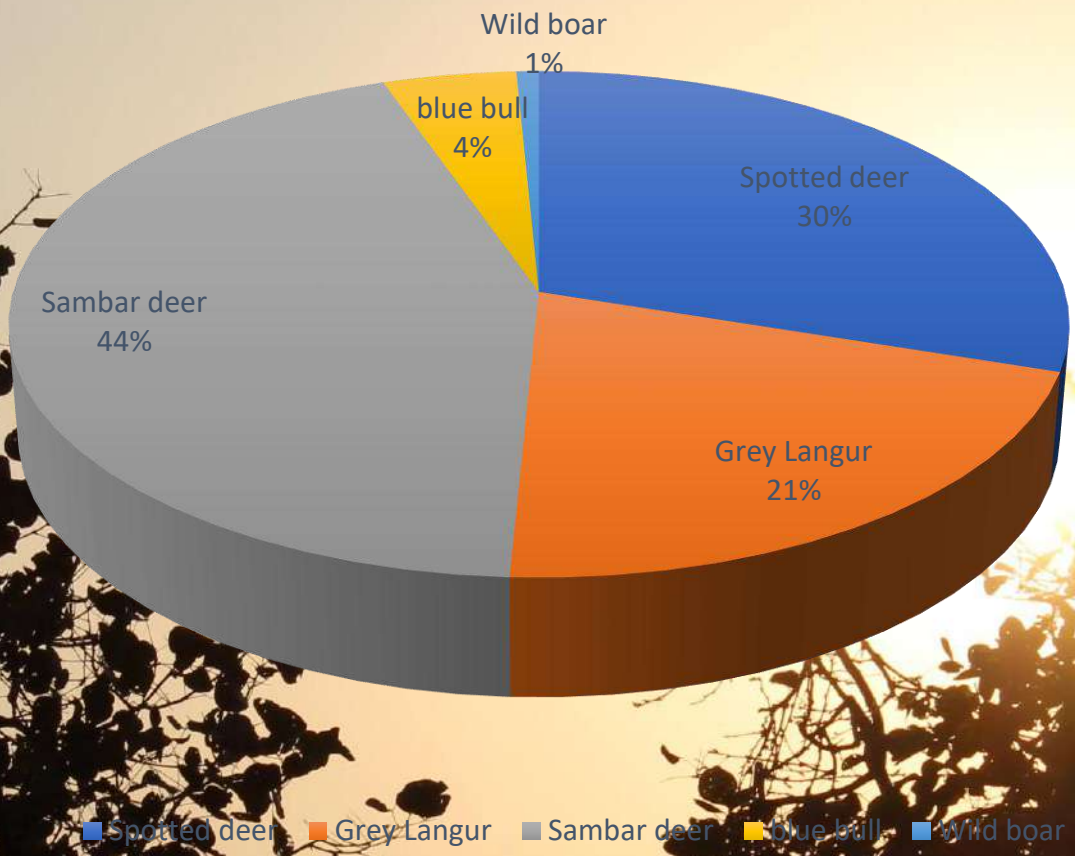
Based on the above data the fauna observed has been ststistically representated as under:

Avian Fauna



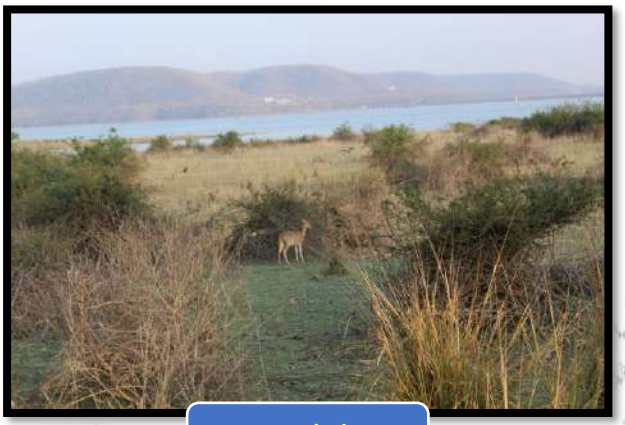
On the basis of the Pie chart drawn for avian fauna we conclude that the dominant species is Peacock with 22 individuals.

Mammalian Fauna



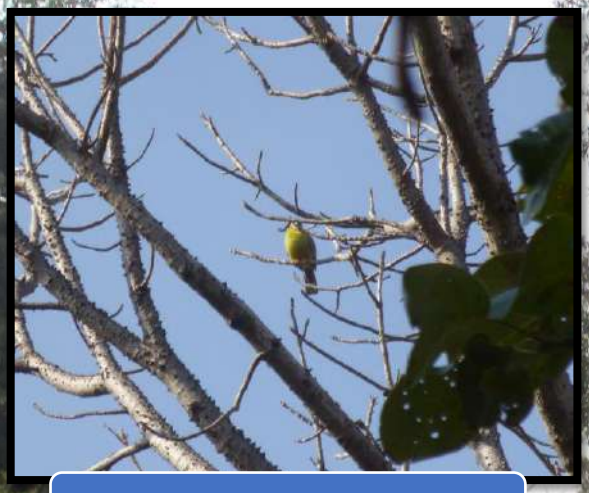
On the basis of the Pie Chart drawn for mammalian fauna we conclude that the dominant species is Sambar deer represented by 37 individuals.

FAUNA OBSERVED IN SAFARI



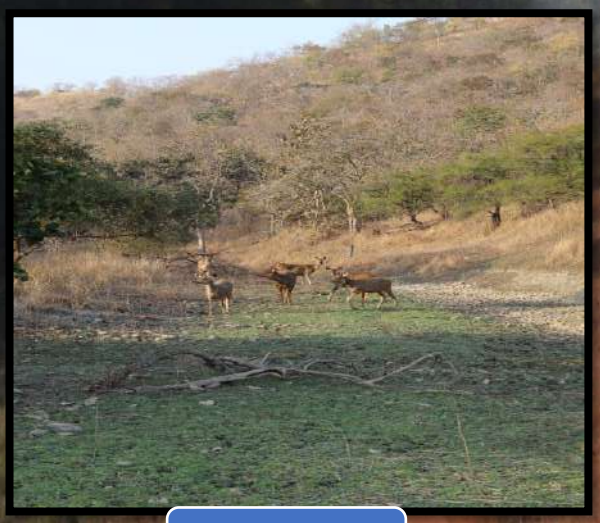
Spotted deer

Sambar deer

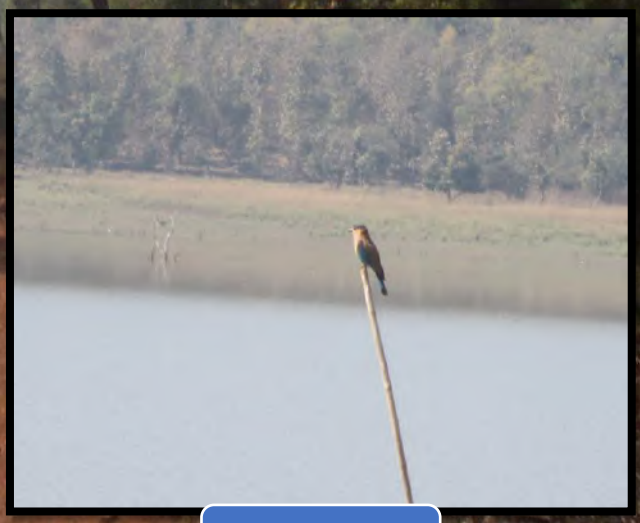


Yellow footed green pigeon

peafowl



Sambar deer



Indian roller

CALCULATION OF THE DIVERSITY INDEX

The data obtained about the distribution of different types of fauna was used to calculate the biodiversity indices.

CALCULATION FOR THE SHANNON WEINER INDEX

The Shannon Weiner index have been calculated for the fauna observed as a whole which means a single table has been prepared for the calculations which includes the animals seen in both morning and afternoon safaris

SAFARI

AVIAN FAUNA

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
1.	Grey Jungle Fowl	4	0.0470	-3.0576	-0.1437
2.	Munia	2	0.0235	-3.7507	-0.0881
3.	Yellow footed green pigeon	8	0.0941	-2.3633	-0.2223
4.	Black Drongo	3	0.0352	-3.3467	-0.1178
5.	Rose ringed parakeet	16	0.1882	-1.6702	-0.3143
6.	Indian roller	6	0.0705	-2.6521	-0.1869
7.	Jungle babbler	4	0.0470	-3.0576	-0.1437
8.	Crested serpent eagle	3	0.0352	-3.3467	-0.1178
9.	Indian pond heron	2	0.0235	-3.7507	-0.0881

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
10.	Peafowl	22	0.2588	-1.3516	-0.3497
11.	Indian cormorant	1	0.0117	-4.4481	-0.0520
12.	Green bee eater	2	0.0235	-3.7507	-0.0881
13.	Grey heron	1	0.0117	-4.4481	-0.0520
14.	White eyes buzzard	1	0.0117	-4.4481	-0.0520
15.	Golden backed woodpecker	1	0.0177	-4.4481	-0.0520
16.	Flame winged parakeet	1	0.0177	-4.4481	-0.0520
17.	Red wattled lapwing	2	0.0235	-3.7507	-0.0881
18.	Peahen	5	0.0588	-2.8336	-0.1666
19.	Spotted dove	1	0.0177	-4.4481	-0.0520
	TOTAL	85			-2.8952

Here $\sum$pi x ln pi =-2.8952
Therefore, Shannon Weiner Index =- (-2.8952)=2.8952
Species Evenness, J= 2.8952/ln 19=0.9832

MAMMALIAN FAUNA

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
1.	Spotted deer	39	0.3	-1.2039	-0.3611
2.	Grey langur	27	0.2076	-3.8747	-0.8043
3.	Blue bull	6	0.0461	-3.0769	-0.1418
4.	Sambar deer	57	0.4384	-0.8246	-0.3636
5.	Wild boar	1	0.0076	-4.8796	-0.0370
	TOTAL	130			-1.6772

Here ∑pi x ln pi =-1.6772
Therefore, Shannon Weiner Index =- (-1.6772)=1.6772
Species Evenness, J=1.6772 /ln 5=1.0421

Since the value of Shannon Weiner index is directly proportional to uncertainty we can predict that the uncertainty in the distribution of Avian fauna(having a higher value of 2.8952) is more than that of Mammalian ones(having lower value of 1.6772). However on the basis of values of species Evenness we can predict that Mammals have more even distribution in ecosystem in comparison to Avian fauna

MAN-WILDLIFE CONFLICT

Human-Wildlife Conflict refers to the interaction between wild animals and people and the resultant negative impact on people or their resources, or wild animals or their habitat. It occurs when growing human populations overlap with established wildlife territory, creating reduction of resources or life to some people and/or wild animals. The conflict takes many forms ranging from loss of life or injury to humans, and animals both wild and domesticated, to competition for scarce resources to loss and degradation of habitat.

OUTCOMES OF CONFLICT

Human-Wildlife conflict occurs with various negative results. The major outcomes of human-wildlife conflict are:

- ❖ Injury and loss of life of humans and wildlife.
- ❖ Crop damage, livestock and depredation, predation of managed wildlife stock.
- ❖ Damage to human property.
- ❖ Trophic cascades.
- ❖ Destruction of habitat.
- ❖ Collapse of wildlife populations and reduction of geographic ranges.

One of the initiators of the concept of man-animal conflict was Das and Guha. They described the two-sided impacts of this conflict. From one side, the source of conflict is the restriction on the local people to access forest resources. On the other side, the source of conflict is the damage incurred to them by wild animals.

SOLUTIONS FOR MAN-WILDLIFE CONFLICT

The solutions are often specific to the species or area concerned, and are often creative and simple.

An important aspect of the work is that it benefits both the animals and local human communities, and actively involves these communities. This is about finding solutions that lead to mutually beneficial co-existence.

The work has also often led to people being more enthusiastic and supportive of conservation, and has demonstrated that people can live alongside wildlife while developing sustainable livelihoods.

These include:

❖ A UNITED EFFORT

In order to be truly effective, prevention of human-wildlife conflict has to involve the full scope of society : International organizations, governments, NGOs communities, communities, consumers and individuals. Solutions are possible, but often they also need to have financial backing for their support and development.

❖ LAND-USE PLANNING

Ensuring that both humans and animals have the space they need is possible. Protecting key areas for wildlife, creating buffer zones and investing in alternative land uses are some of the solutions.

❖COMMUNITY-BASED NATURAL RESOURCE MANAGEMENT

The local community is key since they are the ones who may wake up in the morning with a tiger or bear in their backyard. But they are also the people who can benefit the most from this. If people are empowered to manage their relationship with wild animals, these “unwanted” neighbors can become allies in bringing income and promoting a better quality of life for all.

❖ COMPENSATION/ INSURANCE

Compensation or insurance for animal-induced damage is another widely accepted solution. There are different ways this can be done. In Tadoba, for example, community-based insurance system exists for damage done to livestock. The Indian government pays compensation in areas around the national park.

❖ PAYMENT FOR ENVIRONMENTAL SERVICES

Payment for Environmental Services (PES) is a concept that has recently gained popularity in the international development and conservation community. The most popular of these is financial reward for the sequestering of carbon, but it is also seen as a potential solution for human-wildlife conflict.

❖ WILDLIFE FRIENDLY PRODUCTS

Consumers is distant countries also have a role to play. Always look for products that are environmentally friendly and recognized by serious organizations.

❖ FIELD BASED SOLUTIONS

There are a number of practical field-based solutions that can limit the damage done both to humans and human property, and to wildlife, by preventing wildlife from entering the fields or villages. However, such solutions can only be applied on a case-by-case basis. What people see as solution in one place, they may resist in another. And what works in one place, may have the opposite effect somewhere else.

CASE STUDY IN TADOBA-1

- Name: Roshan Jengtha
- Age: 25 years old
- Village: Junona village
- Residence : Permanent residence
- Work: Work as a house keeper in the resort where we stayed in Tadoba
- Distance between home and forest: 1km from Junona zone
- Literacy: 1 member only (graduation, 1st year)
- Family: 4 members
- Expenditure: In house only
- Tresspassing animals: Spotted deer, Jackal, Tiger, Leopard.
- Agriculture: Rice
- Medicinal plant: Nil
- Working man in the family: 2 members
- Principle occupation: Resort workers
- Annual family income: 30,000 /-
- Number of Human wildlife conflict seen by him: Nil
- Government help: Insufficient

CASE STUDY IN TADOBA-2

- Name: Rakesh Wadai
- Age: 29 years old
- Village: Adilbashi gaon
- Residence : permanent residence
- Work: Forest guide
- Distance between home and forest: 10Km from Junona zone
- Literacy: 4 members (12^{th} pass)
- Family: 5 members
- Expenditure: in House and education
- Tresspassing animals: Spotted deer, Wild boar.
- Agriculture: Nil
- Medicinal plant: Neem, Tulsi, Haldi.
- Working man in the family: 3 members
- Principle occupation: Forest guide
- Family annual income: 30,000/-
- Number of Human wildlife conflict seen by him: 2
- Government help: Insufficient

Picture of us, taking interviews in Tadoba

CASE STUDY IN BOR -1

- Name: Dilip Jogi
- Age: 26 years old
- Village: Bordharan village
- Residence : Permanent residence
- Work: Gypsy Driver
- Distance between home and forest: 1km from Bordharan zone
- Literacy: 1 member only(12th pass)
- Family: 4 members
- Expenditure: in house only
- Tresspassing animals: Spotted deer, Sambar deer, Tiger, Nilgai, Leopard.
- Agriculture: Rice
- Medicinal plant: Neem, Tulsi, Wood-apple
- Working man in the family: 2 members
- Principle occupation: Gypsy driver, Farming
- Family annual income: 84,000/-
- Number of Human wildlife conflict seen by him: Nil
- Government help: Insufficient

CASE STUDY IN BOR -2

- Name: Manjesh Wardey
- Age: 38 years old
- Village: Bordharan village
- Residence : permanent residence
- Work: Hotel manager of one of the resorts in Bordharan
- Distance between home and forest: 1km from Bordharan zone
- Literacy: 1 member only (graduated)
- Family: 5 members
- Expenditure: in house only
- Tresspassing animals: Peacock, Sambar, Leopard
- Agriculture: Nil
- Medicinal plant: Neem, Tulsi
- Working man in the family: 1 Member only
- Principle occupation: Hotel management
- Family annual income: 90,000/-
- Number of Human wildlife conflict seen by him: 2
- Government help: Insufficient

Picture of us, taking interviews in Bor

CONCLUSION

The Gaia Hypothesis proposes that *living organisms interact with their inorganic surroundings on Earth to form a synergistic and self-regulating, complex system that helps to maintain and perpetuate the conditions for life on this planet.* (Lovelock, 1979)

Thus, the conservation of biodiversity is essential for our own survival on this planet. Biodiversity provides us with huge ecosystem services like the maintenance of the air composition and purity, formation and replenishment of soil, pollination of crops, etc.

The studying and inventorying of biodiversity of any particular area is the first step towards

❖ Identification of potential bio resources, which could be of direct use to mankind, as well as

❖ Application of conservation measures and targeting of conservation resources. Due to the limited amount of conservation resources available, it becomes necessary to target them at proper sites. Studying biodiversity helps us to identify the sites and levels where we should apply our conservation measures.

EXCURSION DISCUSSION ON THE LAST DAY OF OUR EDUCATIONAL EXCURSION TRIP AROUND A CAMP FIRE

ACKNOWLEDGEMENT

I take the opportunity to express my profound gratitude and deep regards to our professors, Prof. Swagata Chattopadhyay, Dr. Aniruddha Chatterjee and for their exemplary guidance, monitoring and constant encouragement throughout the course of this educational project. The help and guidance given by her from time to time shall carry me a long way in the long run.

I also take the opportunity to express a deep sense of gratitude to the forest officials for their care, guidance, support and help without which completing this project wouldn't have been easy.

I am also obliged to thank our principal, Dr. Arpita Mukherjee, Dr, Narayan Chandra Das for making it possible for us to go for this trip. I am thankful to the supportive staffs of the Zoology department whose assistance in the laboratory has been of immense help to this project.

Signature of the student

Avipsha Mondal

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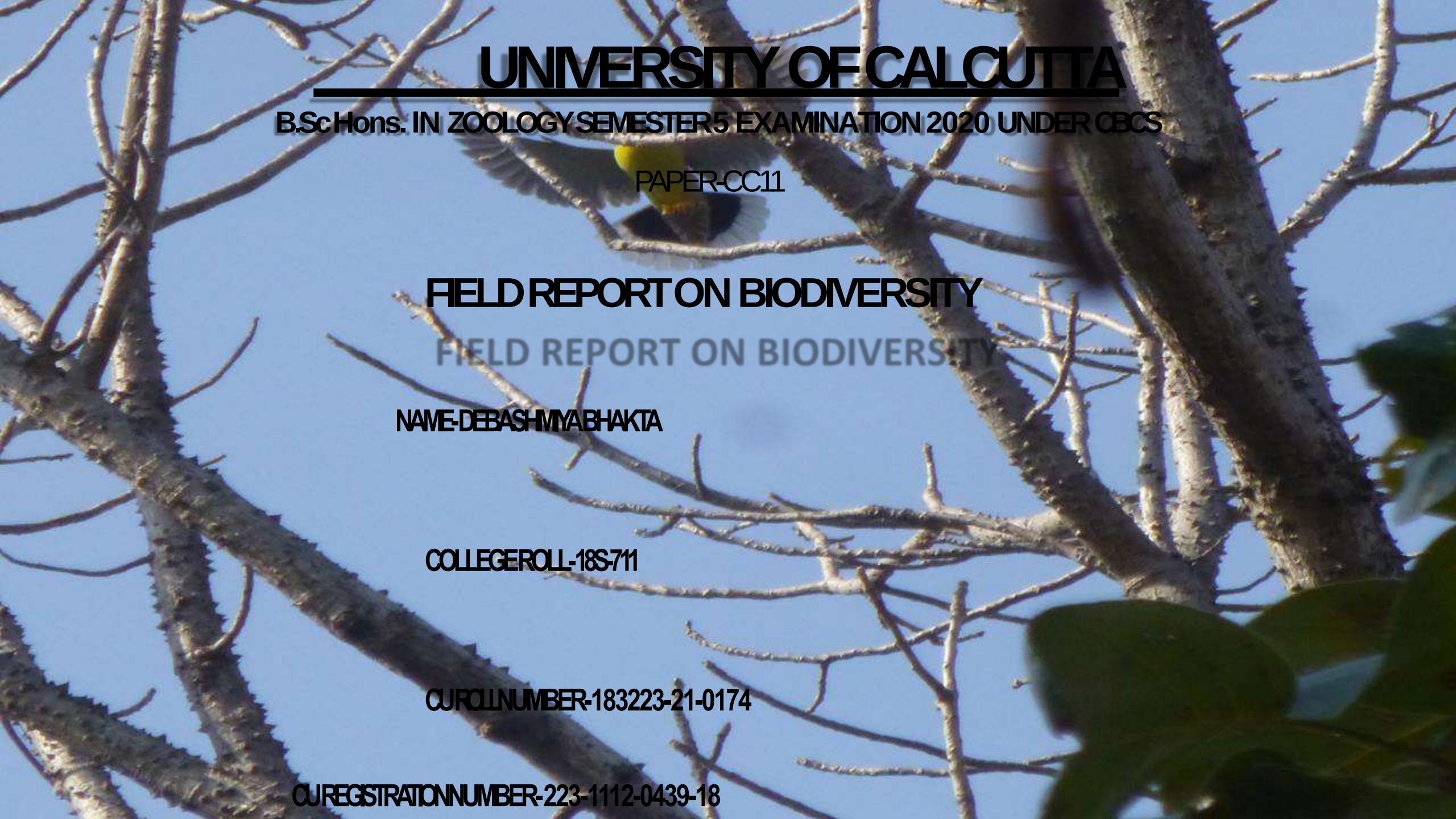
TEACHERS SIGNATURE

Prof. Swagata Chattopadhyay



UNIVERSITY OF CALCUTTA

B.Sc Hons. IN ZOOLOGY SEMESTER 5 EXAMINATION 2020 UNDER CBCS

PAPER-CC11

FIELD REPORT ON BIODIVERSITY

FIELD REPORT ON BIODIVERSITY

NAME-DEBASHMYA BHAKTA

COLLEGE ROLL-18S-711

CU ROLL NUMBER-183223-21-0174

CU REGISTRATION NUMBER-223-1112-0439-18

AIM OF EXCURSION

The purpose of Zoological Excursion is to gain a much deeper knowledge about the topics related to the subject such as wildlife, nature and environment with the help of practical demonstration along with theoretical facts. Wjile their purpose is essentially to educate, they can also be a fun bonding experience for everyone involved.
Moreover without practical knowledge, the study of bio-science is incomplete. It also provides a scope to study wildlife and observe animals and their behaviours in their natural habitat.
Hence a zoological excursion helps us to come in close contact with the flora and fauna of various places with different climatic conditions and atmospheric variations and in better understanding of the relaxation between flora and fauna.

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE

Date of Journey :- 23rd February 2020
Train No & Name :- 12860 Gitanjali Express
Departure Time & Place :- 13:40hrs Howrah Station
Reporting Time & Place :- 12:00hrs at Howrah Station New Complex in front of Mail and Express Inquiry

DETAILS of TOUR PROGRAMME

23/02/20:- Start from **Howrah Station** at 13:40 by **12860 Gitanjali** for **Nagpur Station.**

24/02/20:- Reaching **Nagpur Station** at 07:20hrs. Start from **Nagpur Station** at 08:00hrs by Bus for **Tadoba National Park.** Reaching **Tadoba** at 12.00hrs and transfer at Forest **Rest House and Dormitory.**
Afternoon and Evening : Biodiversity specimen collection studies. Night stay at **Tadoba.**

25/02/20:- Morning and Afternoon coverage **Tadoba National Park Safari (Junona and Agarjhari Zone)** by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at **Tadoba.**

26/02/20:- Start from **Tadoba** at 08.00hrs by Bus for **Bor.** Reaching **Bor** at 12.00hrs and transfer at **Forest Rest House** and **Dormitories.**
Afternoon and Evening : Biodiversity specimen collection studies.
Night stay at **Bor.**

27/02/20:- Morning and Evening coverage **Bor National Park Safari (Bordharan)** by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.

Evening : Biodiversity studies.

Night stay at **Bor.**

28/02/20:- Start from **Bor** at 06.00hrs by Bus for **Nagpur Station.** Reaching **Nagpur Station** at 09.00hrs. Start from **Nagpur Station** at 10.10hrs by **12129 Azad Hind Express** for **Howrah Station.**

29/02/20:- Reaching **Howrah Station** at 04.15hrs.

The Tour Ends

TADOBA-ANDHARI TIGER RESERVE

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

Location

Coordinates: 20°10'N 79°24'E
Total area covered by Tadoba National Park is 116.55 sq.kms.
It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.
The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the Tadoba National Park, created in the year 1955.

Topography

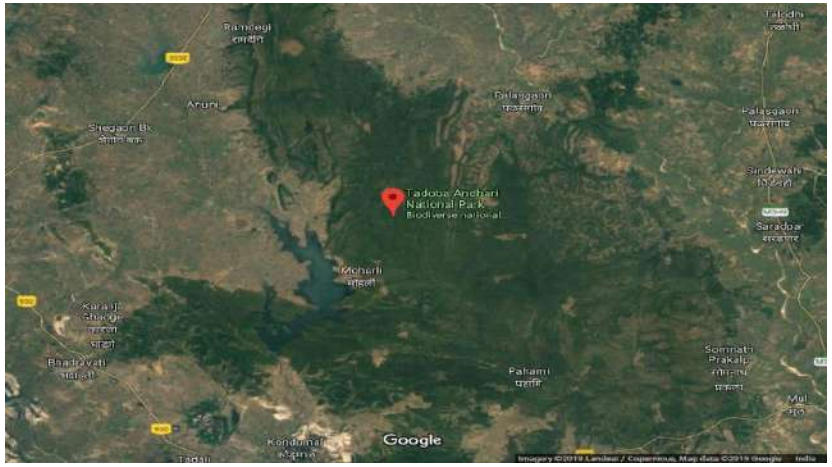
Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges. Densely forested hills form Northern and Western boundary of this area. Elevation of these hills ranges from 200mts to 350mts
Tadoba lake acts as the buffer between the forest and the extensive farmland which extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

Geography

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smocaves provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari rangesoth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and. The south part of the park is less hilly than the remainder.



Location of Tadoba Tiger Reserve on map

Location of the accommodation during our trip

To Reach Tadoba National Park

By Air

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities.

Best Time to Visit Tadoba

March to May is the best time to see tiger as summer temperatures are extremely high especially in the month of May. The monsoon begins from June to September and Vegetation and insect life come alive with the arrival of monsoon in mid June. The post monsoon starts from October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

Climate and Weather of Tadoba National Park

Winters stretch from November to February and day temperatures is between 25°-30°C and the park is looks green. Summers are too hot in Tadoba as the temperature increases to 47°C; even so it is the ideal time to sight mammals near water lakes as the vegetation is also rare, increasing visibility. The monsoon breaks in June with heavy rainfall of approx.1275 mm. and humidity is around 66%.

GROUP PHOTO AT TADOBA-ANDHARI TIGER RESERVE WITH THE TEACHER IN CHARGE

Safari Zones in Tadoba

The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:

Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

Entry Gates for Safari in Tadoba

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai, etc. The movement of tourists inside the park is not restricted like in other reserves, therefore one can completely enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

Moharli Gate: Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.

Kuswanda: The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.

Kolara Gate: This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.

Navegaon Gate: The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.

Pangdi Gate: The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.

Zari Gate: Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

Jeep Safari in Tadoba National Park

The Jeep Safari is the best thing that one can experience in Tadoba National Park. The open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting a tiger and other wild animals are relatively high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more.

The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where the jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives respectively. A park guide has to accompany the jeep for security purpose. Also, the tourists can enter the park by presenting their personal information and identification papers at the gate and the foreigners by showing their passport in original.

The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

Safari Timing in Tadoba

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Junona Zone, Agarjhari Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period	Morning		Afternoon	
	Entry	Exit	Entry	Exit
25th February 2020	6 .30 AM	10:00 AM	2.30 PM –4 PM	6.30 PM

BIODIVERSITY

Biodiversity refers to the variety and variability of life on Earth. Biodiversity typically measures variation at the genetic, species, and ecosystem level. Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.

Biodiversity is not distributed evenly on Earth, and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversity is usually highest along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans. There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

TYPES OF BIODIVERSITY:

Genetic Diversity

- Different genes and combinations of genes within populations
- Allows population of a species to adopt to environmental changes

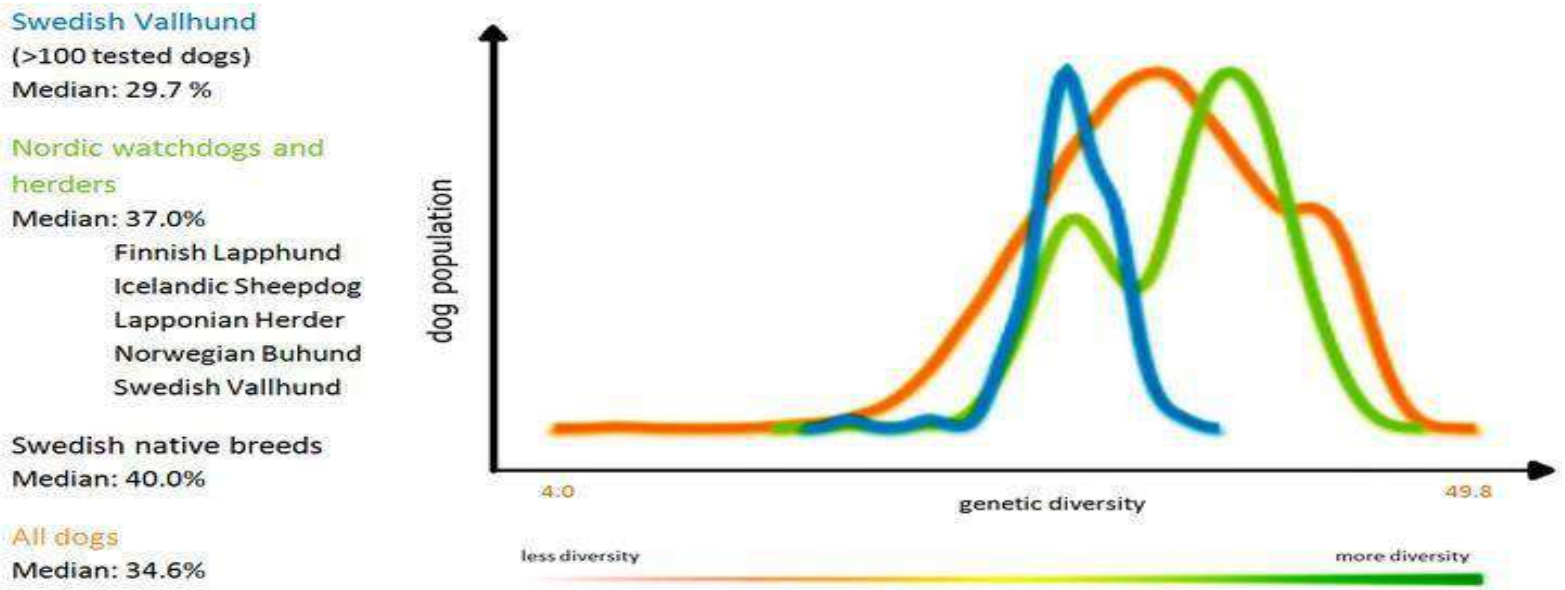


FIG: GENETIC DIVERSITY OF SWEDISH VALLHUND COMPARED TO OTHER BREEDS[1]

Safari Census

We completed a total of 2 safaris in 1 ProtectedArea, namely, Tadoba-Andhari Tiger Reserve.
We went on all the safaris on Gypsies.

Tadoba-Andhari Tiger Reserve Census:

- **Junonazone(Morning Safari) &**
- **Agarzari Zone (Afternoon Safari)**

Avian Fauna

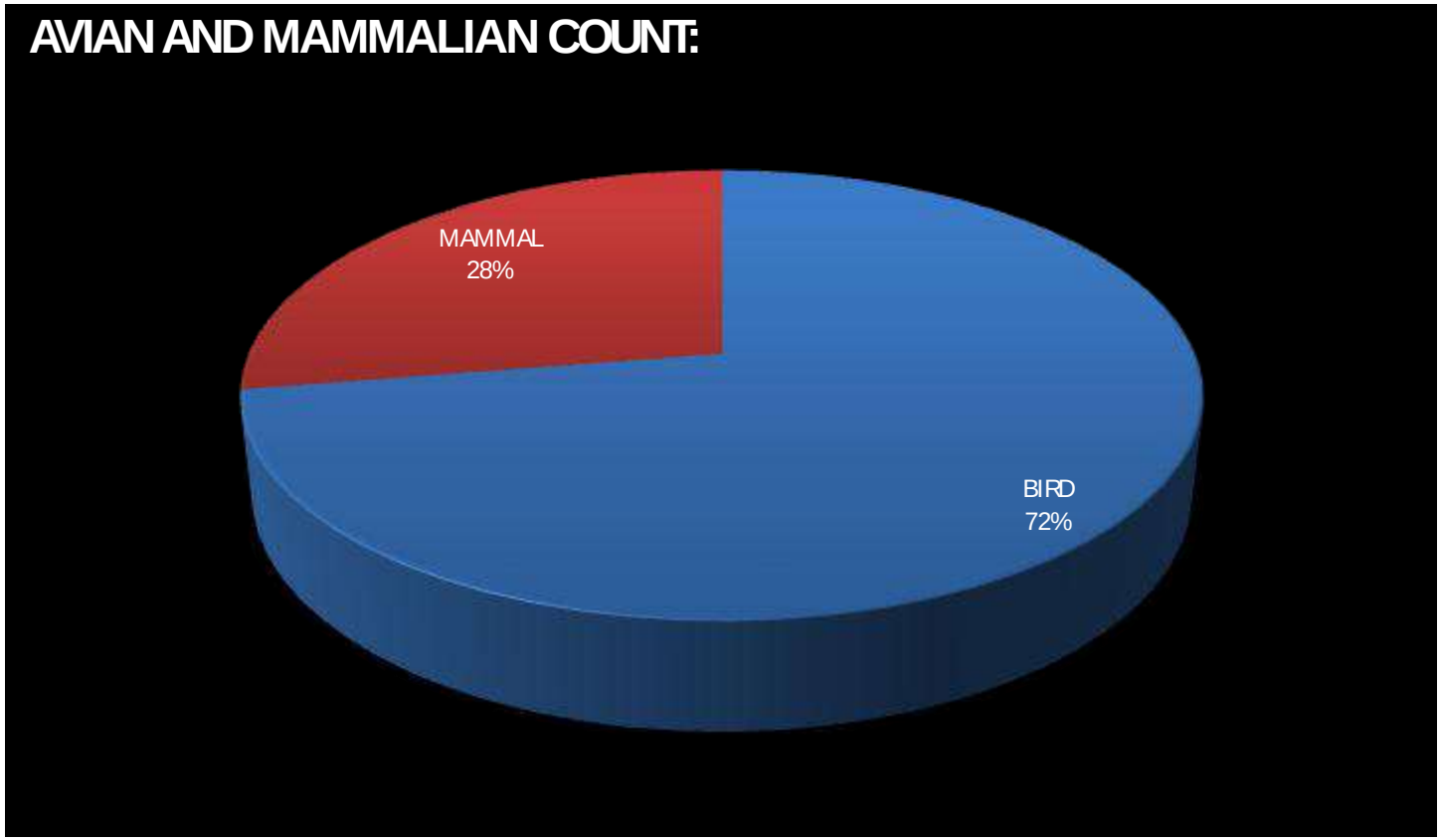
Species	Scientific Name	Count
1. Black Drongo	*Dicrurus macrocercus*	6
1. Parakeet	*Psittacula cyanocephala*	4
1. Black headed ibis	*Threskiornis melanocephalus*	7
1. Lesser egret	*Egretta garzetta*	14
1. Lesser whistling duck	*Dendrocygnajavanica*	17
1. Jacana	*Metopidius indicus*	3
1. White eyed buzzard	*Butastur teesa*	2
1. Indian magpie Robin	*Turdus migratorius*	2
1. Common Kingfisher	*Haleyon smyrnesis*	3
1. Blue kingfisher	*Alcedo atthis*	1
1. Peafowl and peahen	*Pavo cristatus*	14
1. Asian Open -billed stork	*Anastomous oscitans*	9
1. Green Bee eater	*Merops orientalis*	2
1. Red vented bulbul	*Pycnonotus cafer*	6
1. Indian roller	*Coracias benghalensis*	5
1. Rufous treepie	*Dendrocitta vagabunda*	4
1. Rose-ringed parrot	*Psittacula krameri*	3
1. Green junglefowl	*Gallus varius*	12
1. Great Cormorant	*Phalacrocoracidae aristotelis*	11
1. Indian Pond Heron	*Ardeola grayii*	3

-

1.	Purple Heron	*Ardea purpurea*	3
1.	Grey Heron	*Ardea cinerea*	6
	Species	***Scientific name***	**Count**
1.	Jungle owl	*Glaucidium radiatum*	1
1.	Serpent Eagle	*Spilornis cheela*	3
1.	Jungle Babbler	*Turdoides striata*	16
1.	Grey headed Fish eagle	*Ichthyophaga ichthyaetus*	1
1.	Cuckoo	*Cocomantis flabelliformis*	2
1.	Yellow Footed Green Pigeon	*Treron phoenicoptera*	5
1.	Spotted dove	*Spilopelia chinensis*	6
1.	Common starling	*Sturnus vulgaris*	3
1.	Grey hornbill	*Buceros bicornis*	2 2
1.	Purple moorhen	*Porphyrio porphyrio*	15
1.	Red wattled lapwing	*Vanellus indicus*	4
1.	Koel	*Eudynamys scolopaceus*	3
1.	Golden oriole	*Oriolus kundoo*	1
1.	Black hooded oriole	*Oriolus xanthornus*	2
1.	Spotted-billed duck	*Anus poecilorhyncga*	3
1.	Indian Long tailedshrike	*Lanius schach*	1
1.	Greater Coucal	*Centropus sinesis*	3
1.	Common Tailorbird	*Orthotomus sutorius*	4
1.	Woodpecker	*Picidae sp.*	1
1.	Eurasian Thick-knee bird	*Burhinus oedicnemus*	2
1.	Red spurfowl	*Galloperdix spadicea*	1
1.	Little Grebe	*Tachybaptis ruficollis*	1
1.	Glossy Ibis	*Plegadis falcinellus*	1
1.	Osprey	*Pandion haliaetus*	1
1.	House sparrow	*Passer domesticus*	1
1.	Shikra	*Accipiter badius*	1

Mammalian Fauna

Species	*Scientific Name*	Count
1.Spotted deer	*Axis axis*	28
2.Langur	*Semnopithecus entellus*	18
3.Sambar	*Rusa unicolor*	15
4.Barking deer	*Muntiacus muntjak*	2
5. Indian Gaur	*Bos gaurus*	3
6.Dhole	*Cuon alpines*	4
7.Sloth bear	*Melursus ursinus*	3
8.Jackal	*Canis aureous*	1
9.Wild boar	*Sus scrofa*	4
10. Blue bull (nilgai)	*Boselaphus tragocamelus*	2
11.Tiger	*Panthera tigris*	1
12.Tiger cubs	*Panthera tigris*	3
TOTAL OBSERVED		84


AVIAN AND MAMMALIAN COUNT:
MAMMAL
28%
BIRD
72%

Mammalian diversity

Name	Count	pi	ln(pi)	Pi*ln(pi)
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gour	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053

Avian diversity

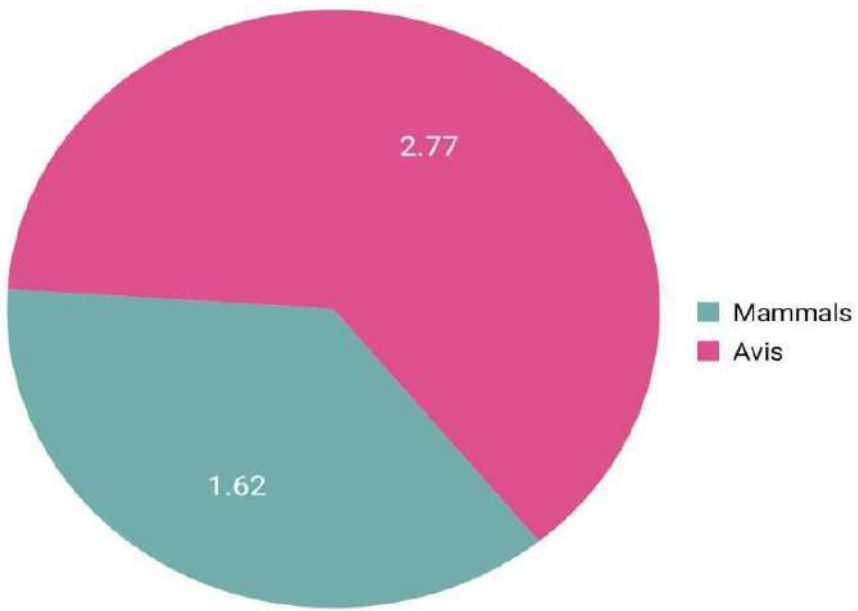
Name	Count	pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190

Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042
Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098
Koyel	3	0.013	-4.299	-0.058
Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149
Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073

Bulbul	6	0.027	-3.606	-0.098
White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042
Spotted billed duck	3	0.013	-4.299	-0.058
Green bee eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufous treepie	4	0.018	-3.452	-0.109
Rose ringed parrot	3	0.013	-4.299	-0.058
Great coucal	3	0.013	-4.299	-0.058
Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002
Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002

House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thickknee bird	2	0.009	-4.705	-0.042
Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013
Purple heron	3	0.013	-4.299	-0.058
Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109
Serpent eagle	3	0.013	-4.299	-0.058
Yellow headed fish eagle	1	0.004	-5.398	-0.002

Yellow footed green pegion	5	0.023	-3.788	-0.085
Indian long tailed shrink	1	0.004	-5.398	-0.002



BIODIVERSITY PIE CHART

FAUNA DIVERSITY TADOBA

INDIAN ROLLER

BLACK HEADED IBIS

ROSE RINGED PARAKEET

PEAFOWL

LESSER EGRET STORK

ASIAN OPENED BILLED

CRESTED SARPENT EAGLE

SHRIKE

INDIAN POND HERON.

COTTON PYGEME GOOSE

WHITE THROATED KINGFISHER

WHITE EYED BUZZARD

YELLOWFOOTED GREEN PIGEON

PIN TAILED DUCK

MAMMALIAN DIVERSITY TADOBA

SLOTH BEAR

TIGRESS MADHURI

BISON

SPOTTED DEER

SAMBAR DEER

INDIAN GAUR

BUSH BEATING

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

•Requirements:

- Umbrella
- Stick/Staff
- 70% Ethyl Alcohol
- Air-tight Containers
- Sterile Gloves
- Tape

•Methodology

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

STUDENTS CARRYING OUT BUSH BEATING

PITFALL

Pitfall-traps: For Soil-surface-active Invertebrates.

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capture more specific types of insects.

- Requirements
- While carrying out Pitfall Trapping
- Containers
- Soap water
- 70% Ethyl Alcohol
- Forceps
- Sterile Gloves
- Sugar

•Methodology

For the Pitfall traps, four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.
4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.
- Soap water was poured into the containers to make the surface slippery and thereby ensuring the avoidance of escape attempts by the captured insect.

FIG: PITFALL TRAP

STUDENTS CARRYING OUT PITFALL.

STUDY OF QUADRATE

•Principle:-

When an ecologist wants to know how many organizations there are in a particular habitat, it would not be feasible to count them all. Instead he would be forced to count a smaller representative part of the population called sample. Sampling of plants & animals that don't move much(such as snails) can be done by using sampling square called quadrate. A suitable size of quadrate depends upon size of the organisms being sampled. For example to count plants growing on college campus one could use a quadrate with size 0.5to 1 meter in length.

•Materials & methods of insects collection:-

1. Small garden gloves
2. Forceps
3. A kill jar containing 70% alcohol
4. Insect pins
5. Ziploc packets & plastic container
6. Labels
7. Strings
8. Wood poles
9. Magnifying glass
10. Newspaper for collection

•Methodology

A suitable site was selected for quadrate work to be done. An area of 1sq was measured & the region was demarcated with the help of string. The string was fixed in square form 1meter*1meter & the corners were fixed with wood poles. Thus the quadrate was formed & various species of flora & fauna were collected with the help of forceps.

STUDENTS CARRYING OUT QUADRATE STUDY

FIG: INSECTS FOUND IN BUSH BEATING, PITFALL AND QUADRATE STUDY

TIGER AS A KEYSTONE SPECIES

- A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether. A keystone species is often, but not always, a predator.
- Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex species can regulate species abundance, diversity, distribution; which in turn can impact the health of terrestrial habitats.
- Additionally they provide essential food sources for the grazers and remove the sick and weak from population of prey species.
- The decimation of these tiger species can have cascading effects throughout the ecosystem they inhabit, resulting in economically and ecologically devastating consequences.
- In India's Kanha National Park, the keystone species is Tiger and the jewel has been described as "barasinha".
- Tiger is the largest of the world's great cats. Barasinha, gaur, sambar, chital, nilgai help to maintain wildlife population.

PUG MARKING

Pug marking is the term used to refer to the footprint of most animals (specially mega fauna). “Pug” means foot in Hindi (Sanskrit –*Padh*; Greek –*Ped*. Every individual animal species has a different pugmark and as such it is used for identification.

•IMPORTANCE OF PUGMARK:

• Wildlife conservationists are known to catalogue pugmarks in the areas they operate.
•Pugmarks are also for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries, etc.
• It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.

•TO MAKE A PLASTER CAST:

• MATERIALS:
• Plaster of Paris (medical quality)
• Water
• A mug to prepare paste
• A strip of thick paper or flexible aluminium.

PUG MARKS OF TIGER

Acknowledgment

I would like to express my special thanks of gratitude to our respected professors Dr. Swagata Chattopadhyay, Dr. Narayan Chandra Das, Dr. Samrat Bhattacharya, Dr. Partha Pal, Dr. Aniruddha Chatterjee, Dr. Malini kundu, Sri Sunil kr Pramanik as well as our principal ma'am Dr. Arpita Mukerji & vice principal sir Dr. Supratim Das who gave us the golden opportunity to do this wonderful field report , which also helped us in doing a lot of Research and we came to know about so many new things we're really thankful to them. Secondly I would also like to thank all my classmates who helped me a lot in finalizing this report within the limited time frame. Without all these helping hands I'll never be able to finish the field report of our memorable excursion to Tadoba-andhari tiger reserve.

Teacher's Signature

UNIVERSITY OF CALCUTTA

B.Sc. Honours in Zoology Semester V Examination - 2020

(Under C.B.C.S.)

PAPER - CC 11

FIELD WORK ASSESSMENT

Name: Debashree Bose
College Roll no : 18S-705

CU REG. NO. : 223-1211-0422-18

CU ROLL NO. : 183223-11-0107

INTRODUCTION

AIM OF EXCURSION

The purpose of zoological excursion is to gain a much deeper knowledge about the topics related to the subject such as wildlife,nature and environment with the help of practical demonstration along with theoretical facts.While their purpose is essentially to educate,they can also be fun bonding experience for everyone involved. Moreover without practical knowledge,the study of bio-science is incomplete. It also provides scope to study wildlife and observe animals and their behaviours in their natural habitat.

Hence zoological excursions help us to come in close contact with the flora and fauna of various places with different climatic conditions and atmospheric variations and in better understanding of the relation between flora and fauna.

IMPORTANCE OF EXCURSION NOTEBOOK

An outstanding field notebook serves many potential purposes

1.It is a valuable record of what you have seen,heard,discussed and thought about in the field.

2.It may contain the data which will lead to an oral presentation,and/or a thesis.

3.It may be a graded portion of a curve.

4.It may be something you and your relatives will find interesting decades in the future.

FIELD DATA COLLECTION PURPOSE OF FIELD NOTES:

- MONEY: Field books contain data which has been collected over weeks or months.The cost of collecting the data can range in the thousand of dollars.

- LITIGATION:Property surveys are subject to court review.The status of the field book can be a very important factor in litigation.
- EFFICIENCY:The information in the field book is used by office personnel to make drawings or calculations.Complete and correct notes are essential.

BASIC REQUIREMENTS FOR GOOD NOTES

>ACCURACY:By far the most important aspect of field notes.
>INTEGRITY:(complete) if the field crew fails to collect all important data,costly delays can occur in the office.
>ARRANGEMENT:Following a standard note format,save time and money when trying to follow notes.
>LEGIBILITY:Major errors can occur if your notes cant be read easily.
>CLARITY:well planned surveys with clear special notations and sketches will great add to the understanding of the survey.

BIODIVERSITY IS THE KEY OF DIVERSITY

Biodiversity is the most commonly used to replace the more clearly defined and long established terms,species diversity and species richness. Biologists most often define biodiversity as the "Totality of genes,species,and ecosystem of a region".Biodiversity is the degree of variation of life. This can refer to genetic variation,or ecosystem variation within an area,biome,or planet. Terrestrial biodiversity tends to be the highest at low latitude near the equator,which seems to be the result of the warm climate and high primary productivity.

Marine biodiversity tends to be highest along coasts in the Western Pacific,when sea surface temperature is highest and in-latitudinal band in all oceans.Biodiversity generally tends to cluster in hotspots,and has been

increasing through time but will be likely to slow in the future. Rapid environmental changes typically cause mass extinctions.

One estimate is that <1%-3% of that species that have existed on earth are extant. The period since the emergence of humans has displayed ongoing biodiversity reduction and an accompanying loss of genetic diversity. Named the Holocene extinction,the reduction is caused primarily by human impacts,particularly habitat destruction.

Conversely,biodiversity impacts human health in a number of ways,both positively and negatively.

The Limited Nations designated 2011-2020 as the Limited Nations Decade on Biodiversity

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE

Date of Journey :- 23rd February 2020

Train No & Name :- 12860 Gitanjali Express

Departure Time & Place :- 13:40hrs Howrah Station

Reporting Time & Place :- 12:00hrs at Howrah Station New Complex in front of Mail and Express Inquiry

DETAILS of TOUR PROGRAMME

23/02/20:- Start from Howrah Station at 13:40 by 12860 Gitanjali for Nagpur Station.

24/02/20:- Reaching Nagpur Station at 07:20hrs. Start from Nagpur Station at 08:00hrs by Bus for Tadoba National Park. Reaching Tadoba at 12.00hrs and transfer at Forest Rest House and Dormitory.

Afternoon and Evening : Biodiversity specimen collection studies. Night stay at Tadoba.

25/02/20:- Morning and Afternoon coverage Tadoba National Park Safari (Junona and Agarjhari Zone) by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.

Evening : Biodiversity studies.

Night stay at Tadoba.

26/02/20:- Start from Tadoba at 08.00hrs by Bus for Bor. Reaching Bor at 12.00hrs and transfer at Forest Rest House and Dormitories.

Afternoon and Evening : Biodiversity specimen collection studies.

Night stay at Bor.

27/02/20:- Morning and Evening coverage Bor National Park Safari (Bordharan) by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.

Evening : Biodiversity studies.

Night stay at Bor.

28/02/20:- Start from Bor at 06.00hrs by Bus for Nagpur Station. Reaching Nagpur Station at 09.00hrs. Start from Nagpur Station at 10.10hrs by 12129 Azad Hind Express for Howrah Station.

29/02/20:- Reaching Howrah Station at 04.15hrs.

The Tour Ends

ACCOMPANYING PERSONS :-

1. Prof. Swagata Chattopadhyay
2. Sri Sunil Kr Pramanik

TADOBA-ANDHARI TIGER RESERVE

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

Location

Coordinates: 20◦10′N 79◦24′E

Total area covered by Tadoba National Park is 116.55 sq.kms.

It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.

The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the Tadoba National Park, created in the year 1955.

Significance

Tadoba National park contains some of the best forest tracks and is endowed with rich biodiversity. It is famous for its natural heritage. Tadoba is an infinite treasure trove of innumerable species of trees and plants - and wildlife that includes Tigers, Panthers, Sloth Bears, Hyenas, Jackals, Wild Dogs, Bison, Barking Deer, NilGai, Sambar, and Cheatal.

Known for its rich biodiversity, the Tadoba National Park is nothing less than a paradise for wildlife enthusiasts. Owing to the presence of the big cats, the park was announced as the 41st Tiger Reserve of India. Along with the tigers, the park provides a home to the Wild Boar, Leopard, Spotted Deer, Rusty Spotted Cat, Indian Mouse Deer, Sambar, Gaur, Sloth Beer, Four Horned Antelope, Flying Squirrel and so on.

Etymology

The word 'Tadoba' is derived from the name of God "Tadoba" or "Taru," which is praised by local tribal people of this region and "Andhari" is derived from the name of Andhari river that flows in this area

Type of Forest

Tadoba reserve is a predominantly southern tropical dry deciduous forest

Physical Factors

Temperature:

Winters are cold with average temperature from 9 to 25 degree celsius.
Summers are dry and the temperature is between 30 to 45 degrees celsius.

Rainfall:

Tadoba
experiences a humid monsoon with rainfall upto 50 inch.

Topography

Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges.
Densely forested hills kiform Northern and Western boundary of this area.
Elevation of these hills ranges from 200mts to 350mts
Tadoba lake acts as the buffer between the forest and the extensive farmland which extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

Geography

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smooth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and caves provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari ranges. The south part of the park is less hilly than the remainder.

FAUNA:-

Mammals: 65 of the keystone species Bengal tiger, Indian Leopard, Sloth bear, Wild dog, Jackal, Sambar, Gaur, Nilgai, Dhole, striped Hyena, small Indian civet, jungle cats, Indian Bison, Barking Deer, Blue Bull, Spotted Dee, Chausingha, Ratel, Flying Squirrel, Wild Boar, Langur, marsh Crocodile.

Reptiles: Indian python, common Indian monitor. Terrapins, Indian star tortoise, Indian cobra Russel's viper

Birds: 195 species of birds. The grey-headed fish eagle, the crested serpent eagle, the changeable hawk-eagle,the raptors.

Other interesting species include the orange-headed thrush, Indian pitta, crested treeswift, stone curlew, crested honey buzzard, paradise flycatcher, bronze-winged jacana and lesser goldenbacked woodpecker. Warblers and the black-naped blue flycatcher .

74 species of butterflies have been recorded including the pansies, monarch, Mormons and swordtails. Insect species include the endangered danaid egg-fly, great eggfly. Dragonflies, stick insects, jewel beetles and the praying mantis, giant wood spider, red wood, wolf spiders, crab spiders and lynx spiders. The most recent census, carried out in 2012, found that the core area has 43 tigers. There are another 22 tigers in the buffer area, and a further 35 in the area surrounding the park.

people can roam here throughout the year, thus they can be witness to spot the tiger and other opulence wild species along with the beautiful dense forest.

Flora

Bamboo	Bambusa sp.
Ain	Terminalia elliptica
Bija	Pterocarpus marsupium
Haldu	Haldina cordifolia
Salai	Boswellia serrata
Semal	Bombax ceiba
Shisham	Dalbergia sissoo
Bel	Aegle marmelos
Mahua	Madhuca longifolia
Palas	Butea monsperma

Hirda	Terminalia chebula
Tendu	Diospyros melanoxylon
Kusum	Schleichera oleosa
Dhawada	Anogeissus latifolia
Karya gum	Sterculia urens

Safari Zones in Tadoba

The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:

Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

Entry Gates for Safari in Tadoba

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai, etc. The movement of tourists inside the park is not restricted like in other reserves, therefore one can completely

enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

1. **Moharli Gate:** Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.
2. **Kuswanda**: The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.
3. **Kolara Gate:** This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.
4. **Navegaon Gate:** The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.
5. **Pangdi Gate:** The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.
6. **Zari Gate**: Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

Jeep Safari in Tadoba National Park

The Jeep Safari is the best thing that one can experience in Tadoba National Park. The open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting a tiger and other wild animals are relatively high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more.

Group photograph

The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where kithe jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives respectively. A park guide has to accompany the jeep for security purpose. Also, the tourists can enter the park by presenting their personal information and identification papers at the gate and the foreigners by showing their passport in original.

The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

Safari Timing in Tadoba

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Moharli (Mohurli) Zone, Tadoba Zone, and Kolsa Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period	Morning		Afternoon	
	Entry	Exit	Entry	Exit
1st Oct to 30th Nov	6 AM - 8 AM	10:00 AM	2.30 PM – 4 PM	6.30 PM
1st Dec to 28th / 29th Feb	6.30 AM - 8.30 AM	11:00 AM	2 PM – 3.30 PM	6:00 PM
1st Mar to 30th April	5.30 AM – 7.30 AM	10:00 AM	3 PM – 4.30 PM	6.30 PM
1st May – 30thJune	5 AM – 7 AM	9.30 AM	3.30 PM – 5 PM	7:00 PM

Location of Tadoba Tiger Reserve on map

National parks in Maharashtra

To Reach Tadoba National Park

By Air

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities.

Best Time to Visit Tadoba

March to May is the best time to see tiger as summer temperatures are extremely high especially in the month of May. The monsoon begins from June to September and Vegetation and insect life come alive with the arrival of monsoon in mid June. The post monsoon starts from October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

Climate and Weather of Tadoba National Park

Winters stretch from November to February and day temperatures is between 25°-30°C and the park is looks green. Summers are too hot in Tadoba as the temperature increases to 47°C; even so it is the ideal time to sight mammals near water lakes as the vegetation is also rare, increasing visibility. The monsoon breaks in June with heavy rainfall of approx.1275 mm. and humidity is around 66%.

BIODIVERSITY

Biodiversity refers to the variety and variability of life on Earth. Biodiversity typically measures variation at the genetic, species, and ecosystem level. Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.

Biodiversity is not distributed evenly on Earth, and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversity is usually highest along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans.

There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

Types of Biodiversity:

1.Genetic Diversity-

- Different genes and combinations of genes within populations
- Allows population of a species to adopt to environmental changes

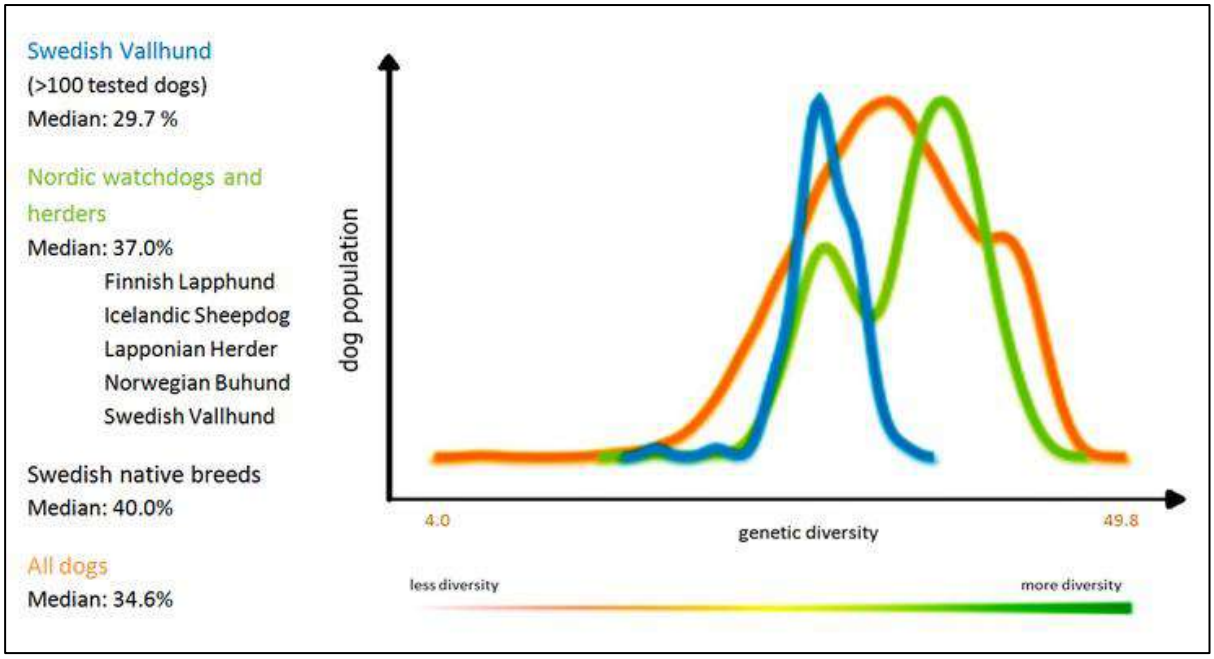


Fig: Genetic Diversity of Swedish Vallhund compared to other breeds[1]

2.Species Diversity-

- Different kinds of organism, relationships among species
- Refers to the number of kinds of species being found

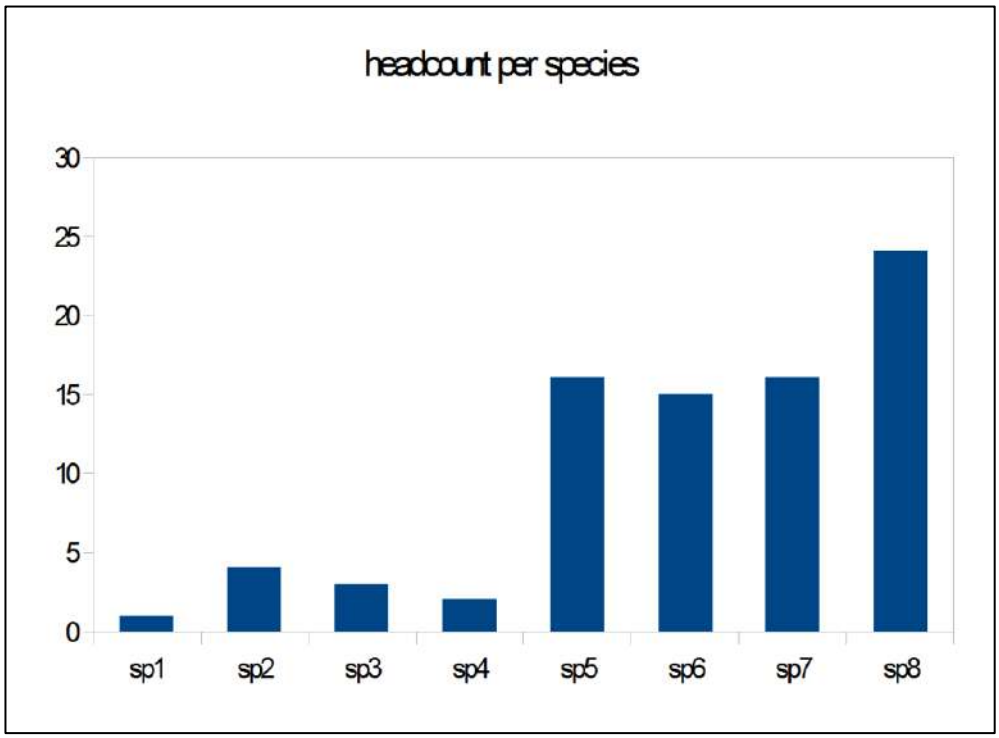


Fig: Fluctuations in species number[2]

3.Ecological Diversity-

- Different habitats, niches, species interactions
- An assemblage of species living in the same area and interacting with an environment

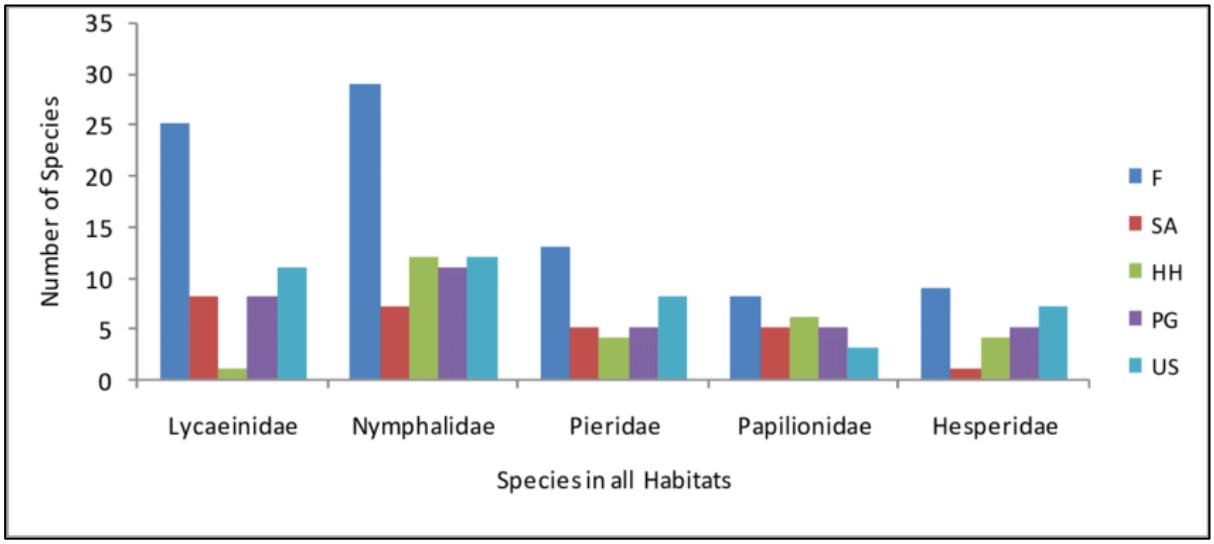


Fig: Species diversity in various Habitats[3]

Safari Census

We completed a total of 4 safaris in 2 Protected Areas, namely, Tadoba Tiger Reserve, Bor Tiger Reserve.

Requirements

1. Notebook and Pen – It was used to keep a note of the species we were able to see and keep a count of them.
2. Binoculars – Olympus Binoculars were used to look far into the depths of the dense forest and high up on the trees to identify the various species, mostly birds, and keep a count.
3. Camera – A Nikon D5200 Digital SLR camera, with a 70-300mm telephoto lens was used to keep photographic evidence of the species observed in their natural habitat.

Safari Census

We completed a total of 2 safaris in 1 Protected Area, namely, Tadoba-Andhari Tiger Reserve.

We went on all the safaris on Gypsies.

Tadoba-Andhari Tiger Reserve Census:

- Junona zone(Morning Safari) &
- Agarzari Zone (Afternoon Safari)

Avian Fauna

Species	*Scientific Name*	Count
1. Black Drongo	*Dicrurus macrocercus*	6
2. Parakeet	*Psittacula cyanocephala*	4
3. Black headed ibis	*Threskiornis melanocephalus*	7
4. Lesser egret	*Egretta garzetta*	14
5. Lesser whistling duck	*Dendrocygnaja vanica*	17
6. Jacana	*Metopidius indicus*	3
7. White eyed buzzard	*Butastur teesa*	2
8. Indian magpie Robin	*Turdus migratorius*	2
9. Common Kingfisher	*Haleyon smyrnesis*	3
10. Blue kingfisher	*Alcedo atthis*	1
11. Peafowl and peahen	*Pavo cristatus*	14
12. Asian Open -billed stork	*Anastomous oscitans*	9

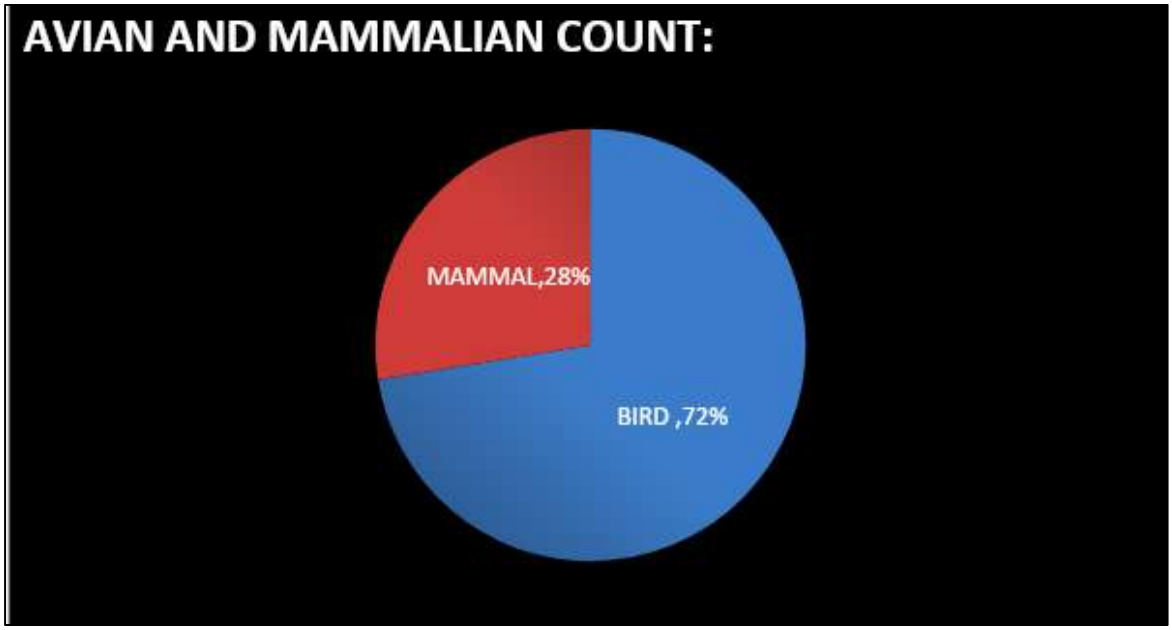
13. Green Bee eater	*Merops orientalis*	2
14. Red vented bulbul	*Pycnonotus cafer*	6
15. Indian roller	*Coracias benghalensis*	5
16. Rufous treepie	*Dendrocitta vagabunda*	4
17. Rose-ringed parrot	*Psittacula krameri*	3
18. Green junglefowl	*Gallus varius*	12
19. Great Cormorant	*Phalacrocoracidae aristotelis*	11
20. Indian Pond Heron	*Ardeola grayii*	3
21. Purple Heron	*Ardea purpurea*	3
22. Grey Heron	*Ardea cinerea*	6
Species	***Scientific name***	**Count**
23. Jungle owl	*Glaucidium radiatum*	1
24. Serpent Eagle	*Spilornis cheela*	3
25. Jungle Babbler	*Turdoides striata*	16
26. Grey headed Fish eagle	*Ichthyophaga ichthyaetus*	1
27. Cuckoo	*Cocomantis flabelliformis*	2
28. Yellow Footed Green Pigeon	*Treron phoenicoptera*	5
29. Spotted dove	*Spilopelia chinensis*	6
30. Common starling	*Sturnus vulgaris*	3

31. Grey hornbill	*Buceros bicornis*	2 2
32. Purple moorhen	*Porphyrio porphyrio*	15
33. Red wattled lapwing	*Vanellus indicus*	4
34. Koel	*Eudynamys scolopaceus*	3
35. Golden oriole	*Oriolus kundoo*	1
36. Black hooded oriole	*Oriolus xanthornus*	2
37. Spotted-billed duck	*Anus poecilorhyncga*	3
38. Indian Long tailed shrike	*Lanius schach*	1
39. Greater Coucal	*Centropus sinesis*	3
40. Common Tailorbird	*Orthotomus sutorius*	4
41. Woodpecker	*Picidae sp.*	1
42. Eurasian Thick -knee bird	*Burhinus oedicnemus*	2
43. Red spurfowl	*Galloperdix spadicea*	1
44. Little Grebe	*Tachybaptis ruficollis*	1
45. Glossy Ibis	*Plegadis falcinellus*	1
46. Osprey	*Pandion haliaetus*	1
47. House sparrow	*Passer domesticus*	1
48. Shikra	*Accipiter badius*	1

TOTAL OBSERVED:		**221**

Mammalian Fauna

Species	***Scientific Name***	**Count**
1.Spotted deer	*Axis axis*	28
2.Langur	*Semnopithecus entellus*	18
3.Sambar	*Rusa unicolor*	15
4.Barking deer	*Muntiacus muntjak*	2
5. Indian Gaur	*Bos gaurus*	3
6.Dhole	*Cuon alpines*	4
7.Sloth bear	*Melursus ursinus*	3
8.Jackal	*Canis aureous*	1
9.Wild boar	*Sus scrofa*	4
10. Blue bull (nilgai)	*Boselaphus tragocamelus*	2
11.Tiger	*Panthera tigris*	1
12.Tiger cubs	*Panthera tigris*	3
TOTAL OBSERVED		**84**



Biodiversity Indices

Biodiversity is one of the primary interests of ecologists, but quantifying the species diversity of ecological communities is complicated. In addition to issues of statistical sampling, the rather arbitrary nature of delineating an ecological community, and the difficulty of positively identifying all of the species present, species diversity itself has two separate components:

1.) the number of species present (*species richness*), and

2.) their relative abundances (termed *dominance* or *evenness*).

As a result, many different measures (or indices) of biodiversity have been developed, such as

1. Shannon index

The idea behind this index is that the diversity of a community is similar to the
amount of information in a code or message. It is calculated in the following way:

$$H' = -\sum\{p_i \times \ln(p_i)\}$$

Where, pi is the proportion of individuals found in species i. For a well-sampled community, we can estimate this proportion as pi = ni/N,
where, ni is the number of individuals in species i and N is the total number of individuals in the community.
Since by definition the pis' will all be between zero and one, the natural log makes all of the terms of the summation negative, which is why we take the inverse of the sum.

Mammalian diversity

Name	Count	pi	ln(pi)	Pi*ln(pi)
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145

Spotted deer	28	0.333	-1.099	-0.366
Indian gour	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053

Summed Biodiversity Index:

Hm=(+1.618)

Avian diversity

Name	Count	pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190
Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042

Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098
Koyel	3	0.013	-4.299	-0.058
Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149

Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042

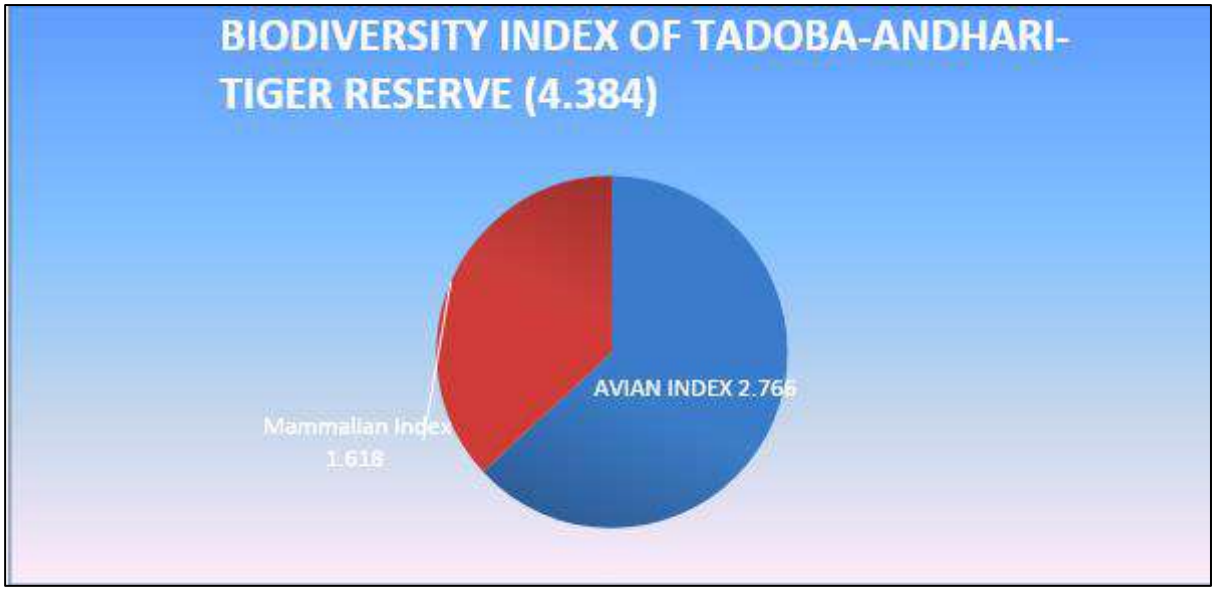
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073
Bulbul	6	0.027	-3.606	-0.098
White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042
Spotted billed duck	3	0.013	-4.299	-0.058
Green bee eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufous treepie	4	0.018	-3.452	-0.109
Rose ringed parrot	3	0.013	-4.299	-0.058
Great coucal	3	0.013	-4.299	-0.058

Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002
Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002
House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thickknee bird	2	0.009	-4.705	-0.042
Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013
Purple heron	3	0.013	-4.299	-0.058

Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109
Serpent eagle	3	0.013	-4.299	-0.058
Yellow headed fish eagle	1	0.004	-5.398	-0.002
Yellow footed green pegion	5	0.023	-3.788	-0.085
Indian long tailed shrink	1	0.004	-5.398	-0.002

Summed Biodiversity Index:

Ha=(+2.766)



Faunal Diversity - Tadoba

Mammalian Fauna

Sloth Bear (*Melursus ursinus*)

Sambar deer *(Rusa unicolor)*

Bison

Tiger (*Panthera tigris*)

Avian Fauna

Fork-tailed Drongo(*Dicrurus adsimilis)*

Indian Roller (*Coracias benghalensis*)

Peacock (*Pavo cristatus*)

Black headed ibis

Quadrate Study

Principal: When an ecologist wants to know how many organisms there in a particular habitat , it would not be feasible to count them all . Instead , he or she would be forced to count a small representative part of the population , called a sample . Sampling of plants or animals that do not move much (such as nails) , can be done using a sampling square called a quadrat . A suitable size of a quadrat depends on the size of the organisms being sampled . For example , to count plants

growing on a school field , one could use a quadrat with sides 0.5 or 1 meter in length.

Setting for Quadrate

Materials & methods of Insect Collection:

-Materials Used

1.Small Garden Shovels

2.Forceps

3.A kill jar containing 70% alcohol

4.Insect pins

5.Zipback packers & plastic containers

6.Labels

7.String

8.Iron poles

9.Magnifying glass

10.Newspaper for collection

Methodology:

A suitable site was selected for the quadrate work to be done. An area of 1sq m was measured and the region was demarcated with the help

of a string . The string was fixed in a square form of 1mX1m and the corners were fixed with iron poles . Thus the quadrat was formed and various species of flora and fauna were collected with the help of forceps.

Bush beating

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

Requirements:

Umbrella
Stick/Staff
70% Ethyl Alcohol
Air-tight Containers
Sterile Gloves
Tape

Methodology

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

Bush beating

Pitfall

Pitfall-traps: For Soil-surface-active Invertebrates

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capture more specific types of insects.

Requirements

- While carrying out Pitfall Trapping

1. Containers
2. Soap water
3. 70% Ethyl Alcohol
4. Forceps
5. Sterile Gloves
6. Sugar

Methodology

For the Pitfall traps, four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.
- Soap water was poured into the containers to make the surface slippery
- and thereby ensuring the avoidance of escape attempts by the captured insect.
- The pitfall trap was allowed to remain intact for about 6 hours. The collected insects were then poured into containers with 70% ethyl alcohol.
- Ethyl Alcohol was used as a preservative for the soft bodied animals as it maintained their elemental composition.

Setting of Pitfall Trap

Pitfall Trap

Specimens found

TADOBA

TIGER AS A KEYSTONE SPECIES

Ø A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist all together. A keystone species is often, but not always, a predator.

Ø Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex predator can regulate species abundance, distribution, diversity; which in turn can impact the health of terrestrial habitats.

Ø Additionally they provide essential food sources for the grazers and remove the sick and weak from the population of prey species.

Ø The decimation of these important tiger species can have cascading effects throughout the ecosystems they inhabit, resulting in economically and ecologically devastating consequences.

Ø In India Kanha National Park, the keystone species is Tiger and the "jewel" has been described as Barasingha.

Ø Tiger is the largest of the world's great cats. Barhasinha, gaur, sambar, chital, nilgai help to maintain wildlife population.

1. **Pug marking:**

Pugmark is the term used to refer to the footprint of most animals (especially mega fauna). "Pug" means foot in Hindi (Sanskrit 'padh'; Greek 'ped'). Every individual animal species has a distinct pugmark and as such this is used for identification.

Importance of Pugmark:

A. Wildlife conservationists are known to catalogue pugmarks in the areas they operate.

B. Pugmarks are also used for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries etc.

C. It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.

To make a plaster cast:

Ø Materials:

I. Plaster of Paris(medical quality).

II. Water.

III. A mug to prepare paste.

IV. A strip of thick paper or flexible aluminum.

ACKNOWLEDGEMENT

We would like to extend our gratitude to our respected Principal Dr.Arpita Mukherji,our respected vice Principal,Dr.Supratim Das,our Head of the department Dr. Narayan Chandra Das,our accompanying professor Dr. Swagata Chattopadhyay and Mr. Sunil Pramanik,alongside to all the professors in our department,who have all helped us all along,immensely.We are highly indebted to them for such an enriching experience that the college heads have solely arranged for the betterment of quality

of learning for the students.It has been a marvellous opportunity to observe and learn amidst the inherent wonders of nature. This excursion has helped all of the classmates to work better as a team and we could all broaden our horizons in terms of ecological survey.

Date of submission : 15/03/2021

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UNVERSITY OF CALCUTTA

Debjani Barman

B.Sc Zoology Honours

Semester V Examination , 2020

Under CBCS

Paper: CC11

Field Work Assessment

College Roll No: 18S-726

CU Registration No: 223-1212-0613-17

CU Roll no. 183223-11-0126

INTRODUCTION

AIM OF EXCURSION

The purpose of zoological excursion is to gain a much deeper knowledge about the topics related to the subject such as wildlife,nature and environment with the help of practical demonstration along with theoretical facts.While their purpose is essentially to educate,they can also be fun bonding experience for everyone involved. Moreover without practical knowledge,the study of bio-science is incomplete. It also provides scope to study wildlife and observe animals and their behaviours in their natural habitat. Hence zoological excursions help us to come in close contact with the flora and fauna of various places with different climatic conditions and atmospheric variations and in better understanding of the relation between flora and fauna.

IMPORTANCE OF EXCURSION NOTEBOOK

An outstanding field notebook serves many potential purposes

1.It is a valuable record of what you have seen,heard,discussed and thought about in the field.

2.It may contain the data which will lead to an oral presentation,and/or a thesis.

3.It may be a graded portion of a curve.

4.It may be something you and your relatives will find interesting decades in the future.

FIELD DATA COLLECTION PURPOSE OF FIELD NOTES:

- MONEY: Field books contain data which has been collected over weeks or months.The cost of collecting the data can range in the thousand of dollars.
- LITIGATION:Property surveys are subject to court review.The status of the field book can be a very important factor in litigation.
- EFFICIENCY:The information in the field book is used by office personnel to make drawings or calculations.Complete and correct notes are essential.

BASIC REQUIREMENTS FOR GOOD NOTES

>ACCURACY:By far the most important aspect of field notes.

>INTEGRITY:(complete) if the field crew fails to collect all important data,costly delays

can occur in the office.

>ARRANGEMENT:Following a standard note format,save time and money when trying to follow notes.

>LEGIBILITY:Major errors can occur if your notes cant be read easily.

>CLARITY:well planned surveys with clear special notations and sketches will great add to the understanding of the survey.

BIODIVERSITY IS THE KEY OF DIVERSITY

Biodiversity is the most commonly used to replace the more clearly defined and long established terms,species diversity and species richness. Biologists most often define biodiversity as the "Totality of genes,species,and ecosystem of a region".Biodiversity is the degree of variation of life. This can refer to genetic variation,or ecosystem variation within an area,biome,or planet. Terrestrial biodiversity tends to be the highest at low latitude near the equator,which seems to be the result of the warm climate and high primary productivity.

Marine biodiversity tends to be highest along coasts in the Western Pacific,when sea surface temperature is highest and in-latitudinal band in all oceans.Biodiversity generally tends to cluster in hotspots,and has been increasing through time but will be likely to slow in the future. Rapid environmental changes typically cause mass extinctions.

One estimate is that <1%-3% of that species that have existed on earth are extant. The period since the emergence of humans has displayed ongoing biodiversity reduction and an accompanying loss of genetic diversity. Named the Holocene extinction,the reduction is caused primarily by human impacts,particularly habitat destruction.

Conversely,biodiversity impacts human health in a number of ways,both positively and negatively.

The Limited Nations designated 2011-2020 as the Limited Nations Decade on Biodiversity.

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE

Date of Journey :- **23rd February 2020**

Train No & Name :- **12860 Gitanjali Express**

Departure Time & Place :- **13:40hrs Howrah Station**

Reporting Time & Place :- **12:00hrs at Howrah Station New Complex in front of Mail and Express Inquiry**

DETAILS of TOUR PROGRAMME

23/02/20:- Start from Howrah Station at 13:40 by 12860 Gitanjali for Nagpur Station.

24/02/20:- Reaching Nagpur Station at 07:20hrs. Start from Nagpur Station at 08:00hrs by Bus for Tadoba National Park. Reaching Tadoba at 12.00hrs and transfer at Forest Rest House and Dormitory.

Afternoon and Evening : Biodiversity specimen collection studies. Night stay at Tadoba.

25/02/20:- Morning and Afternoon coverage Tadoba National Park Safari (Junona and Agarjhari Zone) by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.

Evening : Biodiversity studies.

Night stay at Tadoba.

26/02/20:- Start from Tadoba at 08.00hrs by Bus for Bor. Reaching Bor at 12.00hrs and transfer at Forest Rest House and Dormitories.

Afternoon and Evening : Biodiversity specimen collection studies.

Night stay at Bor.

27/02/20:- Morning and Evening coverage Bor National Park Safari (Bordharan) by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.

Evening : Biodiversity studies.

Night stay at Bor.

28/02/20:- Start from Bor at 06.00hrs by Bus for Nagpur Station. Reaching Nagpur Station at 09.00hrs. Start from Nagpur Station at 10.10hrs by 12129 Azad Hind Express for Howrah Station.

29/02/20:- Reaching Howrah Station at 04.15hrs.

The Tour Ends

ACCOMPANYING PERSONS :-

1. Prof. Swagata Chattopadhyay
2. Sri Sunil Kr Pramanik

TADOBA-ANDHARI TIGER RESERVE

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

Location

Coordinates: 20◦10'N 79◦24'E

Total area covered by Tadoba National Park is 116.55 sq.kms.

It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.

The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the Tadoba National Park, created in the year 1955.

Significance

Tadoba National park contains some of the best forest tracks and is endowed with rich biodiversity. It is famous for its natural heritage. Tadoba is an infinite treasure trove of innumerable species of trees and plants - and wildlife that includes Tigers, Panthers, Sloth Bears, Hyenas, Jackals, Wild Dogs, Bison, Barking Deer, NilGai, Sambar, and Cheatal. Known for its rich biodiversity, the Tadoba National Park is nothing less than a paradise for wildlife enthusiasts. Owing to the presence of the big cats, the park was announced as the 41st Tiger Reserve of India. Along with the tigers, the park provides a home to the Wild Boar, Leopard, Spotted Deer, Rusty Spotted Cat, Indian Mouse Deer, Sambar, Gaur, Sloth Beer, Four Horned Antelope, Flying Squirrel and so on.

Etymology

The word 'Tadoba' is derived from the name of God "Tadoba" or "Taru," which is praised by local tribal people of this region and "Andhari" is derived from the name of Andhari river that flows in this area

Type of Forest

Tadoba reserve is a predominantly southern tropical dry deciduous forest

Physical Factors

Temperature:

Winters are cold with average temperature from 9 to 25 degree celsius.

Summers are dry and the temperature is between 30 to 45 degrees celsius.

Rainfall:

Tadoba

experiences a humid monsoon with rainfall upto 50 inch.

Topography

Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges. Densely forested hills kiform Northern and Western boundary of this area. Elevation of these hills ranges from 200mts to 350mts

Tadoba lake acts as the buffer between the forest and the extensive farmland which

extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

Geography

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smooth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and caves provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari ranges. The south part of the park is less hilly than the remainder.

FAUNA:-

Mammals: 65 of the keystone species Bengal tiger, Indian Leopard, Sloth bear, Wild dog, Jackal, Sambar, Gaur, Nilgai, Dhole, striped Hyena, small Indian civet, jungle cats, Indian Bison, Barking Deer, Blue Bull, Spotted Dee, Chausingha, Ratel, Flying Squirrel, Wild Boar, Langur, marsh Crocodile.

Reptiles: Indian python, common Indian monitor. Terrapins, Indian star tortoise, Indian cobra Russel's viper

Birds: 195 species of birds. The grey-headed fish eagle, the crested serpent eagle, the changeable hawk-eagle,the raptors.

Other interesting species include the orange-headed thrush, Indian pitta, crested treeswift, stone curlew, crested honey buzzard, paradise flycatcher, bronze-winged jacana and

lesser goldenbacked woodpecker. Warblers and the black-naped blue flycatcher .
74 species of butterflies have been recorded including the pansies, monarch, Mormons and swordtails. Insect species include the endangered danaid egg-fly, great eggfly. Dragonflies, stick insects, jewel beetles and the praying mantis, giant wood spider, red wood, wolf spiders, crab spiders and lynx spiders. The most recent census, carried out in 2012, found that the core area has 43 tigers. There are another 22 tigers in the buffer area, and a further 35 in the area surrounding the park.
people can roam here throughout the year, thus they can be witness to spot the tiger and other opulence wild species along with the beautiful dense forest.

Flora

Bamboo	Bambusa sp.
Ain	Terminalia elliptica
Bija	Pterocarpus marsupium
Haldu	Haldina cordifolia
Salai	Boswellia serrata
Semal	Bombax ceiba
Shisham	Dalbergia sissoo
Bel	Aegle marmelos
Mahua	Madhuca longifolia
Palas	Butea monsperma
Hirda	Terminalia chebula
Tendu	Diospyros melanoxylon
Kusum	Schleichera oleosa
Dhawada	Anogeissus latifolia
Karya gum	Sterculia urens

Safari Zones in Tadoba

The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:
Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular

for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.
Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.
Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

Entry Gates for Safari in Tadoba

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai, etc. The movement of tourists inside the park is not restricted like in other reserves, therefore one can completely enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

1. Moharli Gate: Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.
2. Kuswanda: The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.
3. Kolara Gate: This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.
4. Navegaon Gate: The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.
5. Pangdi Gate: The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.
6. Zari Gate: Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

Jeep Safari in Tadoba National Park

The Jeep Safari is the best thing that one can experience in Tadoba National Park. The

open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting a tiger and other wild animals are relatively high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more. The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where kithe jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives respectively. A park guide has to accompany the jeep for security purpose. Also, the tourists can enter the park by presenting their personal information and identification papers at the gate and the foreigners by showing their passport in original.

The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

Safari

Group photograph

Safari Timing in Tadoba

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Moharli (Mohurli) Zone, Tadoba Zone, and Kolsa Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period	Morning		Afternoon	
	Entry	Exit	Entry	Exit
1st Oct to 30th Nov	6 AM - 8 AM	10:00 AM	2.30 PM – 4 PM	6.30 PM
1st Dec to 28th / 29th Feb	6.30 AM - 8.30 AM	11:00 AM	2 PM – 3.30 PM	6:00 PM
1st Mar to 30th April	5.30 AM – 7.30 AM	10:00 AM	3 PM – 4.30 PM	6.30 PM
1st May – 30thJune	5 AM – 7 AM	9.30 AM	3.30 PM – 5 PM	7:00 PM

Location of Tadoba Tiger Reserve on map

National parks in Maharashtra

To Reach Tadoba National Park

By Air

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or

cabs from the airport to reach the park.

By Train

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities.

Best Time to Visit Tadoba

March to May is the best time to see tiger as summer temperatures are extremely high especially in the month of May. The monsoon begins from June to September and Vegetation and insect life come alive with the arrival of monsoon in mid June. The post monsoon starts from October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

Climate and Weather of Tadoba National Park

Winters stretch from November to February and day temperatures is between 25°-30°C and the park is looks green. Summers are too hot in Tadoba as the temperature increases to 47°C; even so it is the ideal time to sight mammals near water lakes as the vegetation is also rare, increasing visibility. The monsoon breaks in June with heavy rainfall of approx.1275 mm. and humidity is around 66%.

BIODIVERSITY

Biodiversity refers to the variety and variability of life on Earth. Biodiversity typically measures variation at the genetic, species, and ecosystem level. Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.

Biodiversity is not distributed evenly on Earth, and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversity is usually highest along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans.

There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

Types of Biodiversity:

Genetic Diversity

- Different genes and combinations of genes within populations
- Allows population of a species to adopt to environmental changes

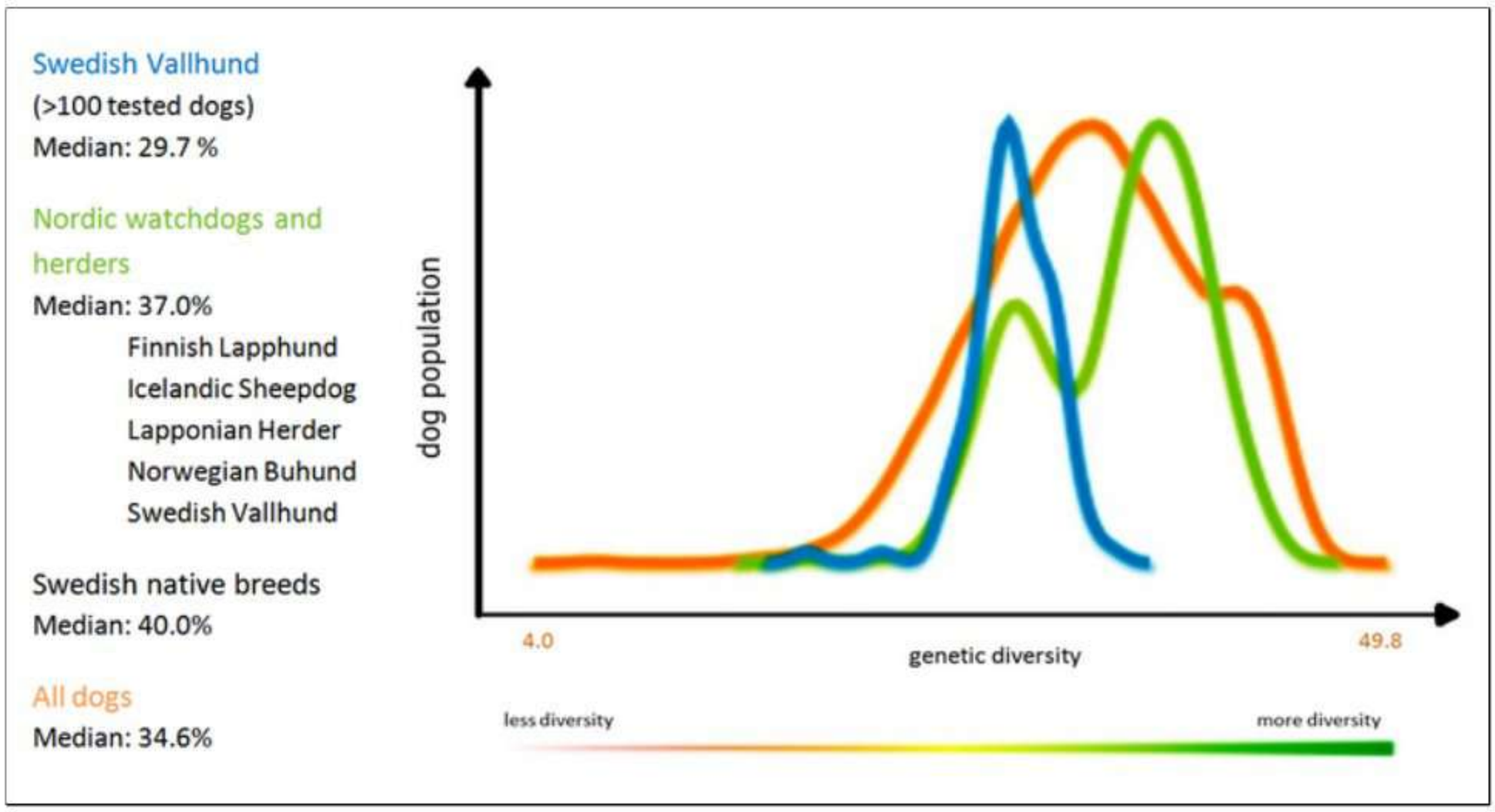


Fig: Genetic Diversity of Swedish Vallhund compared to other breeds[1]

Species Diversity

- Different kinds of organism, relationships among species
- Refers to the number of kinds of species being found

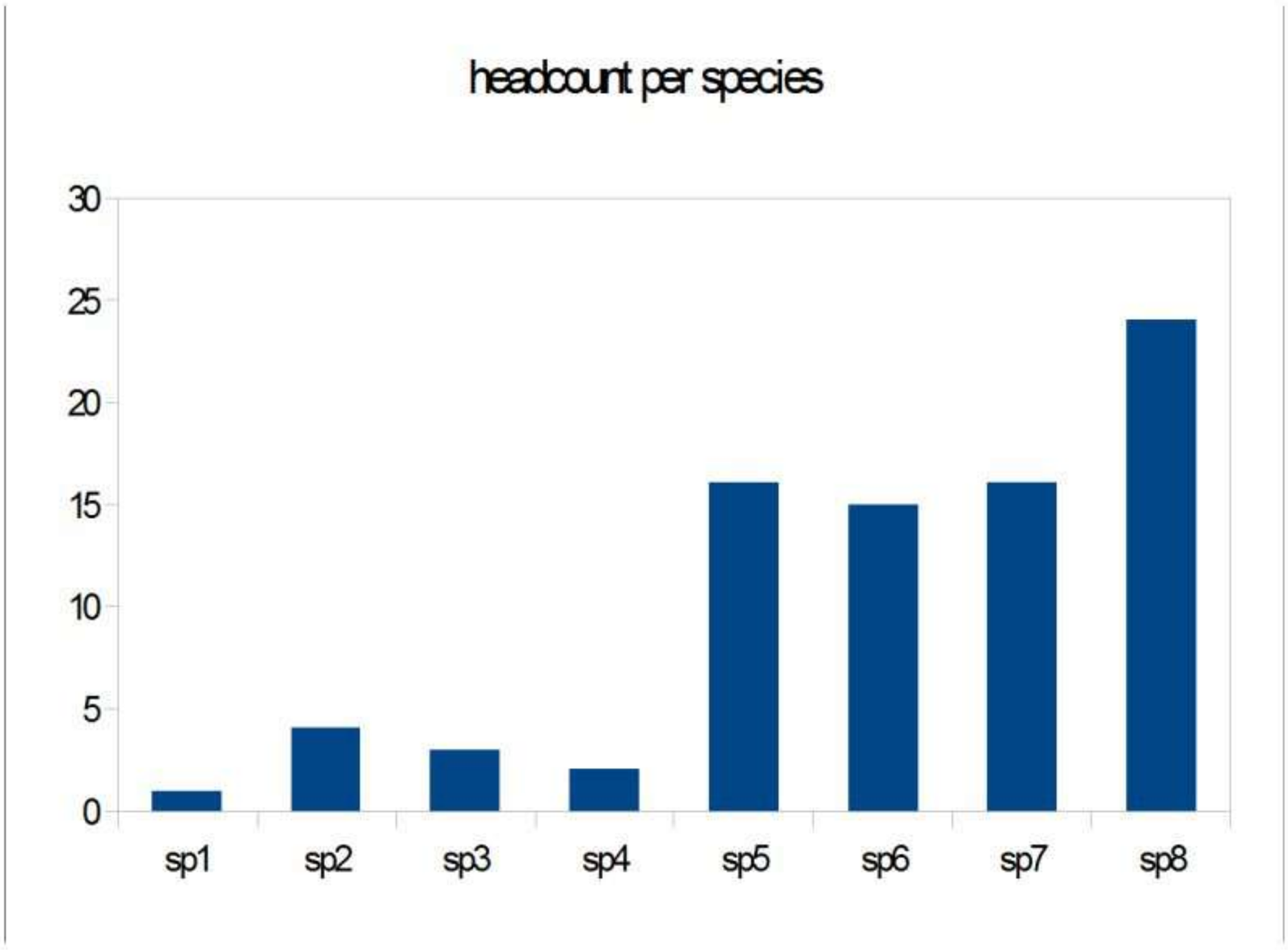


Fig: Fluctuations in species number[2]

Ecological Diversity

- Different habitats, niches, species interactions
- An assemblage of species living in the same area and interacting with an environment

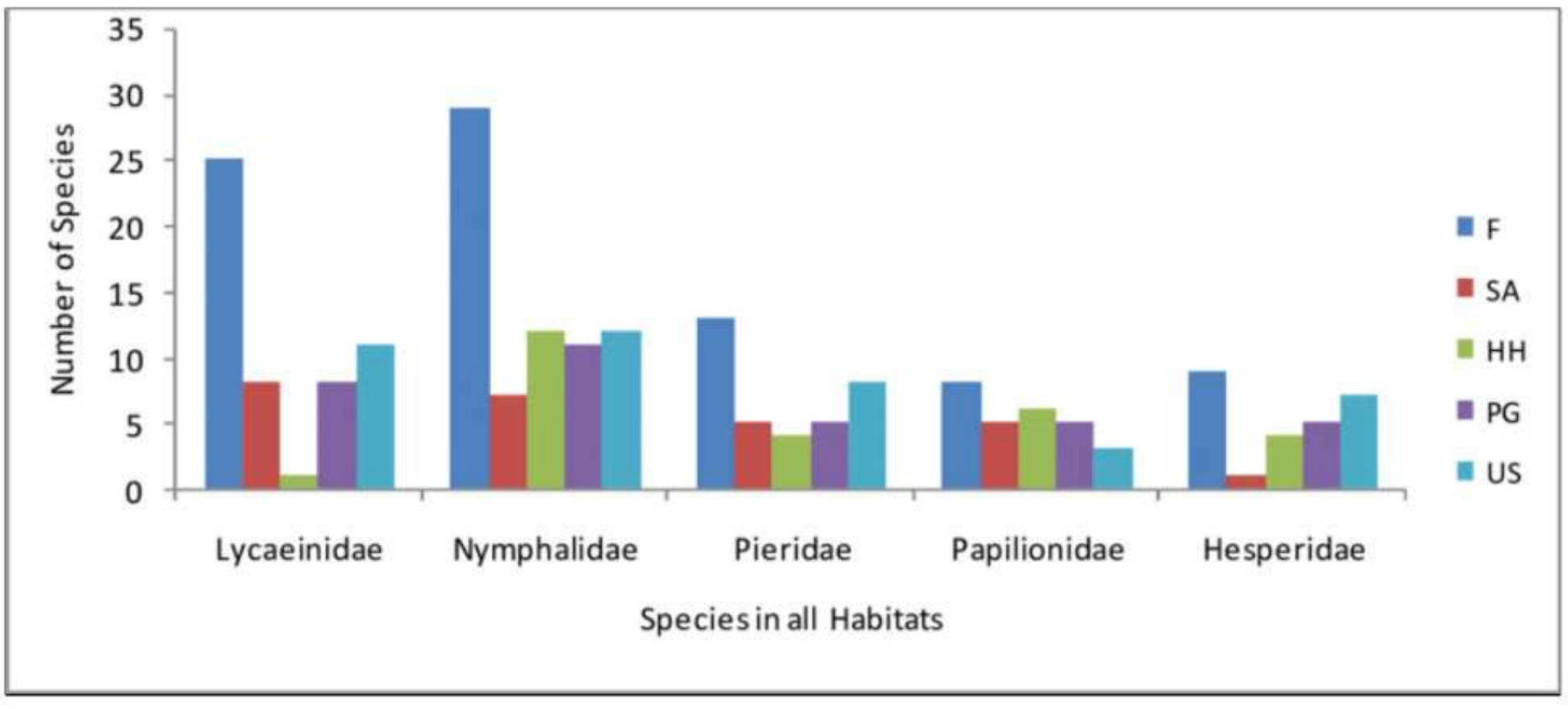


Fig: Species diversity in various Habitats[3]

Safari Census

We completed a total of 4 safaris in 2 Protected Areas, namely, Tadoba Tiger Reserve, Bor Tiger Reserve.

Requirements

1. Notebook and Pen – It was used to keep a note of the species we were able to see and keep a count of them.
2. Binoculars – Olympus Binoculars were used to look far into the depths of the dense forest and high up on the trees to identify the various species, mostly birds, and keep a count.
3. Camera – A Nikon D5200 Digital SLR camera, with a 70-300mm telephoto lens was used to keep photographic evidence of the species observed in their natural habitat.

Safari Census

We completed a total of 2 safaris in 1 Protected Area, namely, Tadoba-Andhari Tiger Reserve.

We went on all the safaris on Gypsies.

Tadoba-Andhari Tiger Reserve Census:

- Junona zone(Morning Safari) &
- Agarzari Zone (Afternoon Safari)

Avian Fauna

Species	*Scientific Name*	Count
1. Black Drongo	*Dicrurus macrocercus*	6
2. Parakeet	*Psittacula cyanocephala*	4
3. Black headed ibis	*Threskiornis melanocephalu*	7
4. Lesser egret	*Egretta garzetta*	14
5. Lesser whistling duck	*Dendrocygnajavanica*	17
6. Jacana	*Metopidius indicus*	3
7. White eyed buzzard	*Butastur teesa*	2
8. Indian magpie Robin	*Turdus migratorius*	2

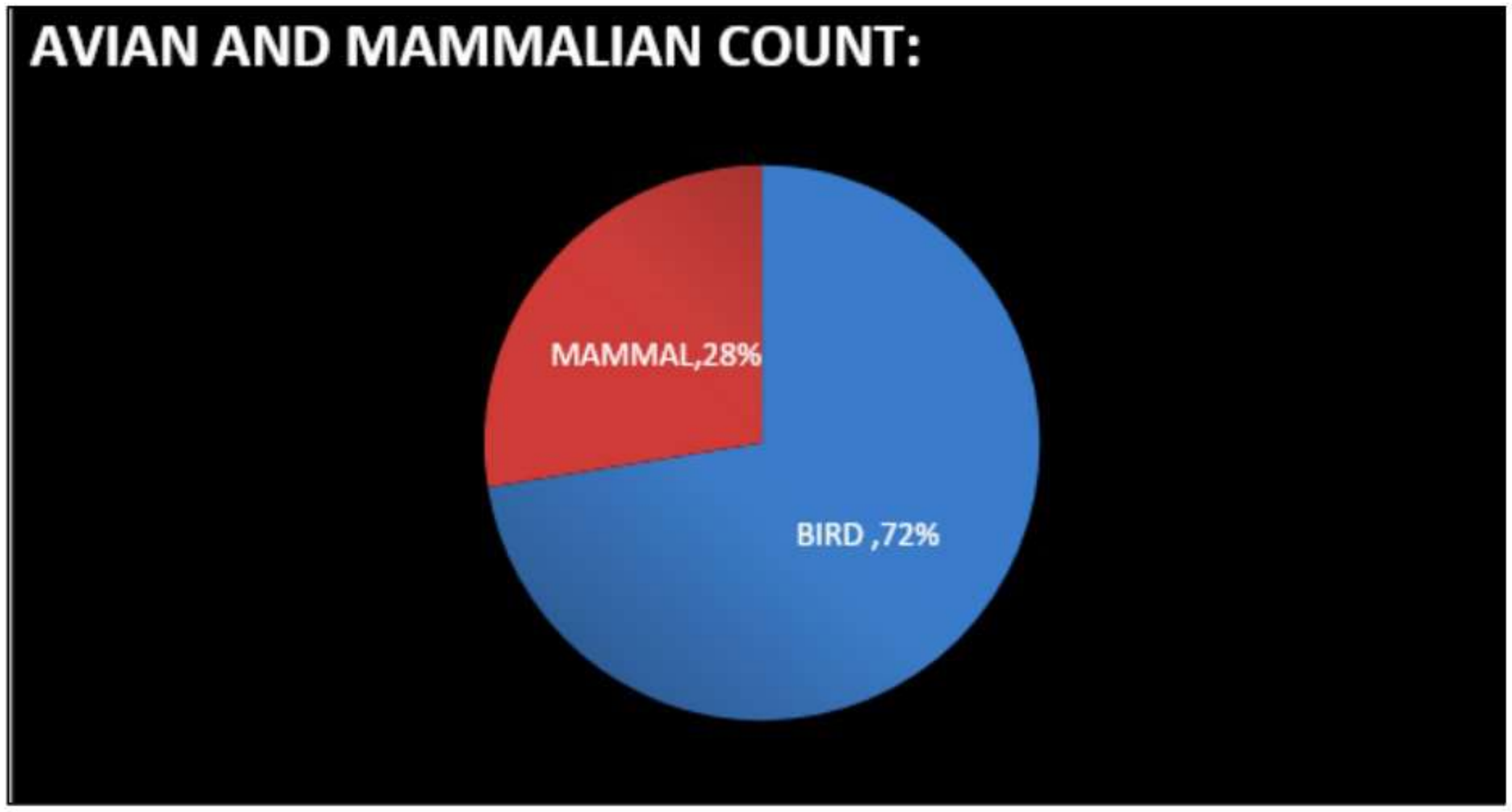
9. Common Kingfisher	*Haleyon smyrnesis*	3
10. Blue kingfisher	*Alcedo atthis*	1
11. Peafowl and peahen	*Pavo cristatus*	14
12. Asian Open -billed stork	*Anastomous oscitans*	9
13. Green Bee eater	*Merops orientalis*	2
14. Red vented bulbul	*Pycnonotus cafer*	6
15. Indian roller	*Coracias benghalensis*	5
16. Rufous treepie	*Dendrocitta vagabunda*	4
17. Rose-ringed parrot	*Psittacula krameri*	3
18. Green junglefowl	*Gallus varius*	12
19. Great Cormorant	*Phalacrocoracidae aristotelis*	11
20. Indian Pond Heron	*Ardeola grayii*	3
21. Purple Heron	*Ardea purpurea*	3
22. Grey Heron	*Ardea cinerea*	6
Species	***Scientific name***	**Count**
23. Jungle owl	*Glaucidium radiatum*	1
24. Serpent Eagle	*Spilornis cheela*	3
25. Jungle Babbler	*Turdoides striata*	16
26. Grey headed Fish eagle	*Ichthyophaga ichthyaetus*	1
27. Cuckoo	*Cocomantis flabelliformis*	2
28. Yellow Footed Green Pigeon	*Treron phoenicoptera*	5
29. Spotted dove	*Spilopelia chinensis*	6
30. Common starling	*Sturnus vulgaris*	3
31. Grey hornbill	*Buceros bicornis*	2
32. Purple moorhen	*Porphyrio porphyrio*	15
33. Red wattled lapwing	*Vanellus indicus*	4
34. Koel	*Eudynamys scolopaceus*	3
35. Golden oriole	*Oriolus kundoo*	1
36. Black hooded oriole	*Oriolus xanthornus*	2
37. Spotted-billed duck	*Anus poecilorhyncga*	3
38. Indian Long tailed shrike	*Lanius schach*	1
39. Greater Coucal	*Centropus sinesis*	3

40. Common Tailorbird	*Orthotomus sutorius*	4
41. Woodpecker	*Picidae sp.*	1
42. Eurasian Thick -knee bird	*Burhinus oedicnemus*	2
43. Red spurfowl	*Galloperdix spadicea*	1
44. Little Grebe	*Tachybaptis ruficollis*	1
45. Glossy Ibis	*Plegadis falcinellus*	1
46. Osprey	*Pandion haliaetus*	1
47. House sparrow	*Passer domesticus*	1
48. Shikra	*Accipiter badius*	1
TOTAL OBSERVED:		**221**

Mammalian Fauna

Species	*Scientific Name*	Count
1.Spotted deer	*Axis axis*	28
2.Langur	*Semnopithecus entellus*	18
3.Sambar	*Rusa unicolor*	15
4.Barking deer	*Muntiacus muntjak*	2
5. Indian Gaur	*Bos gaurus*	3
6.Dhole	*Cuon alpines*	4
7.Sloth bear	*Melursus ursinus*	3
8.Jackal	*Canis aureous*	1
9.Wild boar	*Sus scrofa*	4
10. Blue bull (nilgai)	*Boselaphus tragocamelus*	2
11.Tiger	*Panthera tigris*	1
12.Tiger cubs	*Panthera tigris*	3

TOTAL OBSERVED		84



Biodiversity Indices

Biodiversity is one of the primary interests of ecologists, but quantifying the species diversity of ecological communities is complicated. In addition to issues of statistical sampling, the rather arbitrary nature of delineating an ecological community, and the difficulty of positively identifying all of the species present, species diversity itself has two separate components:

1.) the number of species present (*species richness*), and

2.) their relative abundances (termed *dominance* or *evenness*).

As a result, many different measures (or indices) of biodiversity have been developed, such as

1. ***Shannon index***

The idea behind this index is that the diversity of a community is similar to the amount of information in a code or message. It is calculated in the following way:

$$H' = -\sum\{p_i \times \ln(p_i)\}$$

Where, pi is the proportion of individuals found in species i. For a well-sampled community, we can estimate this proportion as pi = ni/N,
where, ni is the number of individuals in species i and N is the total number of individuals in the community.
Since by definition the pis' will all be between zero and one, the natural log makes all of the terms of the summation negative, which is why we take the inverse of the sum.

Mammalian diversity

Name	Count	pi	ln(pi)	Pi*ln(pi)
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gour	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053

Summed Biodiversity Index:

Hm=(+1.618)

Avian diversity

Name	Count	pi	ln(pi)	pi*ln(pi)
Jungle	16	0.072	-2.626	-0.190

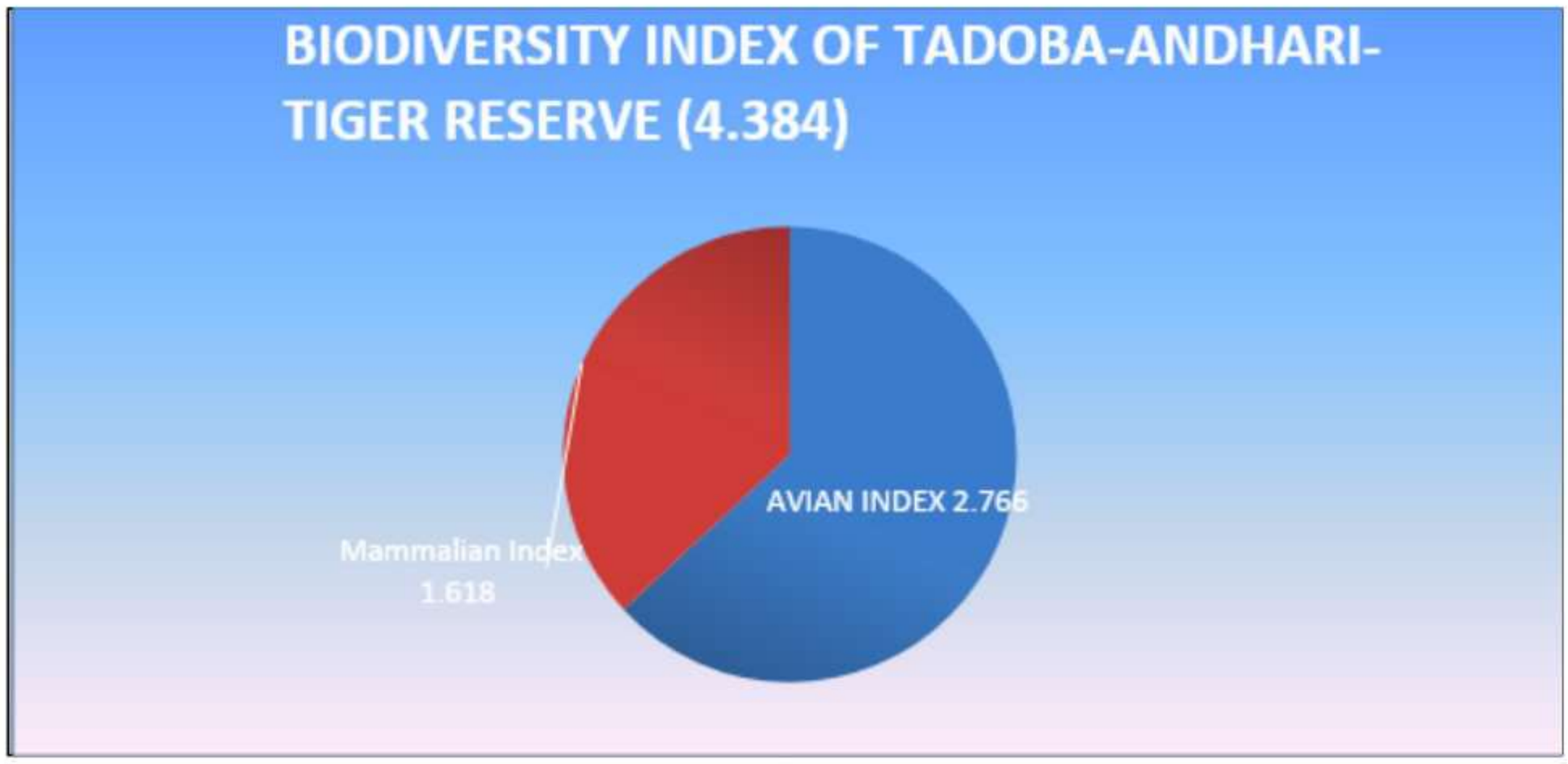
babbler				
Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042
Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098
Koyel	3	0.013	-4.299	-0.058
Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149
Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073
Bulbul	6	0.027	-3.606	-0.098
White throated	3	0.013	-4.299	-0.058

kingfisher				
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042
Spotted billed duck	3	0.013	-4.299	-0.058
Green bee eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufous treepie	4	0.018	-3.452	-0.109
Rose ringed parrot	3	0.013	-4.299	-0.058
Great coucal	3	0.013	-4.299	-0.058
Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002
Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002
House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thickknee bird	2	0.009	-4.705	-0.042

Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013
Purple heron	3	0.013	-4.299	-0.058
Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109
Serpent eagle	3	0.013	-4.299	-0.058
Yellow headed fish eagle	1	0.004	-5.398	-0.002
Yellow footed green pegion	5	0.023	-3.788	-0.085
Indian long tailed shrink	1	0.004	-5.398	-0.002

Summed Biodiversity Index:

Ha=(+2.766)



Faunal Diversity - Tadoba

Mammalian Faun

Sloth Bear (*Melursus ursinus*)

Sambar deer *(Rusa unicolor)*

Bison

Tiger (*Panthera tigris*)

Avian Fauna

Fork-tailed Drongo(*Dicrurus adsimilis)*

Indian Roller (*Coracias benghalensis*)

Peacock (*Pavo cristatus*)

Black headed ibis

Quadrate Study

Principal: When an ecologist wants to know how many organisms there in a particular habitat , it would not be feasible to count them all . Instead , he or she would be forced to count a small representative part of the population , called a sample . Sampling of plants or animals that do not move much (such as nails) , can be done using a sampling square called a quadrat . A suitable size of a quadrat depends on the size of the organisms being sampled . For example , to count plants growing on a school field , one could use a quadrat with sides 0.5 or 1 meter in length.

Materials & methods of Insect Collection:

-Materials Used

1.Small Garden Shovels

2.Forceps

3.A kill jar containing 70% alcohol

4.Insect pins

5.Zipback packers & plastic containers

6.Labels

7.String

8.Iron poles

9.Magnifying glass

10.Newspaper for collection

Methodology:

A suitable site was selected for the quadrate work to be done. An area of 1sq m was measured and the region was demarcated with the help of a string . The string was fixed in a square form of 1mX1m and the corners were fixed with iron poles . Thus the quadrat was formed and various species of flora and fauna were collected with the help of forceps.

Bush beating

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

Requirements:

Umbrella

Stick/Staff

70% Ethyl Alcohol

Air-tight Containers

Sterile Gloves

Tape

Methodology

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

Pitfall

Pitfall-traps: For Soil-surface-active Invertebrates

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capture more specific types of insects.

Requirements

- While carrying out Pitfall Trapping

1. Containers
2. Soap water
3. 70% Ethyl Alcohol
4. Forceps
5. Sterile Gloves
6. Sugar

Methodology

For the Pitfall traps, four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.
- Soap water was poured into the containers to make the surface slippery

- and thereby ensuring the avoidance of escape attempts by the captured insect.
- The pitfall trap was allowed to remain intact for about 6 hours. The collected insects were then poured into containers with 70% ethyl alcohol.
- Ethyl Alcohol was used as a preservative for the soft bodied animals as it maintained their elemental composition.

Setting for pitfall trap

Specimens found

TADOBA

TIGER AS A KEYSTONE SPECIES

Ø A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or ceast to exist all together. A keystone species is often, but not always, a predator.

Ø Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex predator can regulate species abundance, distribution, diversity; which in turn can impact the health of terrestrial habitats.

Ø Additionally they provide essential food sources for the grazers and remove the sick and weak from the population of prey species.

Ø The decimation of these important tiger species can have cascading effects throughout the ecosystems they inhabit, resulting in economically and ecologically devastating consequences.

Ø In India Kanha National Park, the keystone species is Tiger and the

"jewel" has been described as Barasingha.

Ø Tiger is the largest of the world's great cats. Barhasinha, gaur, sambar, chital, nilgai help to maintain wildlife population.

1. Pug marking:

Pugmark is the term used to refer to the footprint of most animals (especially mega fauna). "Pug" means foot in Hindi (Sanskrit 'padh'; Greek 'ped'). Every individual animal species has a distinct pugmark and as such this is used for identification.

Importance of Pugmark:

A. Wildlife conservationists are known to catalogue pugmarks in the areas they operate.

B. Pugmarks are also used for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries etc.

C. It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.

To make a plaster cast:

Ø **Materials:**

I. Plaster of Paris(medical quality).

II. Water.

III. A mug to prepare paste.

IV. A strip of thick paper or flexible aluminum.

ACKNOWLEDGEMENT

We would like to extend our gratitude to our respected Principal Dr.Arpita Mukherji,our respected vice Principal,Dr.Supratim Das,our Head of the department Dr. Narayan Chandra Das,our accompanying professor Dr. Swagata Chattopadhyay and Mr. Sunil Pramanik,alongside to all the professors in our department,who have all helped us all along,immensely.We are highly indebted to them for such an enriching experience that the college heads have solely arranged for the betterment of quality of learning for the students.It has been a marvellous opportunity to observe and learn amidst the inherent wonders of nature. This excursion has helped all of the classmates to work better as a team and we could all broaden our horizons in terms of ecological survey.

UNIVERSITY OF CALCUTTA

B.Sc. Honours in Zoology Semester-V Examination-2020

(Under C.B.C.S.)

PAPER- CC 11

FIELD WORK ASSESSMENT

ECOSYSTEM AND ITS BIODIVERSITY ASSESSMENT

Name: Gargi Mondal

College Roll No: 18S - 716

ROLL NUMBER: 183223-11-0116

REGISTRATION NUMBER: 223-1212-0441-18

INDEX

ABSTRACT

- This project on "ECOSYSTEM AND ITS BIODIVERSITY ASSESSMENT " prepared encompasses the description of various ecosystems present in the Tadoba Andheri Tiger Reserve (Chandrapur, Maharashtra, India), Bor Tiger Reserve (Manoli, Maharashtra). It also contains an account of the diverse flora and fauna that are found there. An attempt has been made herein to present an idea about the different kinds of animals present in their distribution. The number of individuals of different species of animals as observed during the jungle safaris have been recorded and presented. The use of Shannon Weiner's Biodiversity Indices has been used to explain the dominance and richness of the species that were observed during the safaris. Apart from that, an account of the activities that we did to study the diversity of invertebrate fauna (particularly arthropods) also has been presented. To explain the population of animals in the forest ecosystem (a rough idea) the use of numerous pie chart have been made

OBJECTIVE

The objectives for this project on “ECOSYSTEM AND ITS BIODIVERSITY ASSESSMENT” are as follows

- ✓ To have an idea about the structure and functioning of the ecosystem.
- ✓To gain knowledge about the biodiversity in general.
- ✓To examine the varieties of ecosystems and biodiversity found conservation areas.
- ✓To understand how different species of animals interact with the environment and components.
- ✓To have an idea about the different kinds of habitats and ecosystems present in the protected places we went to.
- ✓To have knowledge about different species of animals found in the national parks and sanctuaries.
- ✓To study the diversity pattern of fauna.
- ✓To understand faunal dominance and evenness in the distribution of fauna.
- ✓To predict the uncertainty in the ecosystem.
- ✓To learn to identify the different varieties of fauna.
- ✓To build a knowledge regarding the correlation of ecosystem and biodiversity.

ECOSYSTEM- BRIEF INTRODUCTION

The word 'ecosystem' was coined by A.G.Tansley in 1935.

According to Eugene.P.Odum (1983), "Any unit that includes all the organisms that functions together in a given area interacting with the physical environment so that a flow of energy leads to clearly defined biotic structures and non living parts is an ecological system or ecosystem."

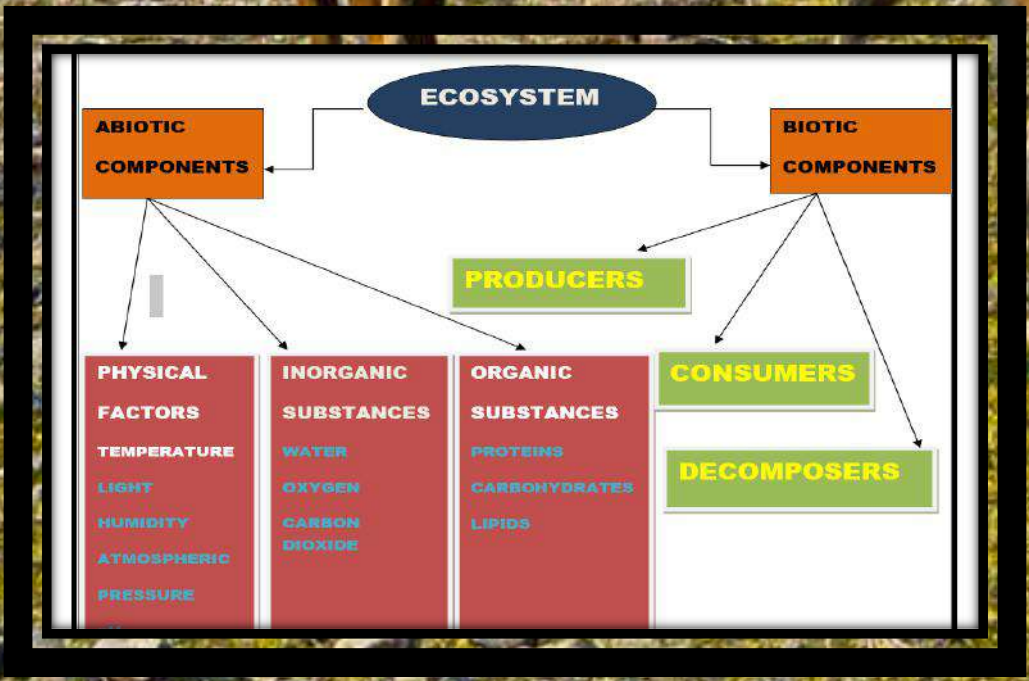
Lake ecosystem

Ecosystem is the largest functional unit of ecology.

COMPONENTS OF AN ECOSYSTEM

According to E.P.Odum, the components of an ecosystem are

A flowchart of Ecosystem



TERRESTRIAL ECOSYSTEMS

FOREST ECOSYSTEM:

Forests have community of plants having trees, shrubs, herbs and climbers. Forest trees show random growth they do not grow in rows as observed in plantation by man. In a natural forest, trees grow in communities such as Teak- *Terminalia* community or *Zizyphus* acacia community. Wild animals are very important part of forest ecosystem.

GRASSLAND ECOSYSTEM:

A grassland ecosystem is a collection of plants, animals and microorganisms that live in an environment where grasses are the primary sources of vegetation.

AQUATIC ECOSYSTEMS

Types of Aquatic Ecosystems:

1. **Lentic System:** It refers to stationary or relatively still water. Lentic water is considered to be present in ponds, lakes, and wetlands.

   Characteristics:

   - ❖ There is a marked stability in the physicochemical properties of water.
   - ❖ There are thermal stratifications as well as that of oxygen and nutrients.
   - ❖ They are closed systems.
   - ❖ Light illuminates only the upper layers- the limnetic zone, where active photosynthesis and growth occurs which results in plenty of oxygen and rapid consumption of nutrients. Profundal and benthic zones are dark. Some oxygen also dissolves in the surface water from the atmosphere above.

Zonation:

- ❖ Littoral Zone: The zone around the margins of a water body which consists of shallow waters. Plenty of light is available and rooted plants can grow in this zone only.
- ❖ Limnetic Zone: It is the zone of open waters which are deeper as well. Available of plenty of light promotes active photosynthesis and growth of free floating autotrophs- the planktons.
- ❖ Profundal Zone: This zone occurs under the limnetic zone and receives very little light. Hence, it can be referred to as aphotic zone in contrast to euphotic zone. (limnetic and littoral), which are well illuminat The ed.
- ❖ Benthic zone: It lies under the Profundal zone, which is at the bottom region of the water body. Both profundal and benthic zones are characterized by the presence of heterotrophs which live on dead and decaying organic matter.

1. **Lotic System:** They are those systems which contain flowing waters, the basic function of the lotic bodies of water is to carry the surplus rain water back to the sea.

Characteristics:

- ❖ There is a continuous unidirectional flow in a lotic ecosystem.
- ❖ Plenty of oxygen is derived from air above which is evenly distributed throughout the water mass. To this, is added the oxygen produced by the autotrophs. Oxygen depletion is therefore, rare in unpolluted lotic waters.
- ❖ Turbidity usually limits light penetration to deeper zones of lotic systems.
- ❖ The physiochemical properties of water are also in a state of perpetual change. Stratification and stagnation are altogether absent.

Zonation:

According to illies and Botosaneanu (1963), two major subdivisions have been recognized:

- ❖ Ritthorn Zone: It is the steep and torrential upper course. It is also called Rapid Zone. It is characterized by steep, narrow, shallow and turbulent rifles or rapids.
- ❖ Potamon Zone: It is the flat slow running lower course. It is also called the Pool Zone. It is the flatter, wider and deeper pool.

As a part of our project on ECOSYSTEM ASSESSMENT, we conducted studies on the Forest and Aquatic ecosystems, assessing the various abiotic and biotic components of it

BIODIVERSITY-BRIEF INTRODUCTION

DEFINITION

The term Biodiversity was popularized by socio-biologist Edward Wilson to describe the combined diversity or heterogeneity at all the levels of biological organization right from macromolecules within the cells, genes, species, ecosystems and biomes.

TYPES OF BIODIVERSITY

1. GENETIC DIVERSITY:

Genetic Diversity is a measure of variety in genetic information contained in the organisms. Within a species, genetic diversity occurs in the differences of alleles, entire genes and chromosomal structures. More than 50000 genetically different strains of rice and 1000 varieties of mango occur in India due to genetic variations.

2. SPECIES DIVERSITY:

It refers to the variety of species within a region. For example, Western Ghats have greater amphibian diversity as compared to Eastern Ghats.

3. ECOLOGICAL DIVERSITY:

It is the variety of ecosystems which indicate diversity in the number of niches, trophic levels, food webs, nutrient cycles and ecological processes sustaining energy flow. For example, ecosystem diversity is high in India because of the occurrence of a large number of ecosystems.

LEVELS OF BIODIVERSITY

1. ALPHA DIVERSITY:

It refers to the diversity within a particular area or ecosystems and is usually expressed by the number of species in that ecosystem.

2. BETA DIVERSITY:

It refers to the diversity of species between two separate ecosystems.

3. GAMMA DIVERSITY:

It is a measure of the overall diversity for the different ecosystems present in a community.

HOW MANY SPECIES ON EARTH AND HOW MANY IN INDIA?

According to the International Union of Conservation Of Nature and Natural Resources (IUCN, 2004), the total number of plant and animal species described so far is slightly more than 1.5 million, but there is no clear idea of how many species are yet to be discovered and described.

1. Number of animal species is more than 70%. Plants (including algae, fungi, bryophytes, gymnosperms, and Angiosperms) account for nearly 22% of the total.

2. Among animals, insects are the most species-rich taxonomic group, making more than 70% of the total, out of every 10 animals on this plant, 7 are insect.

3. Number of fungi species (72000) in the world is more than the combined total of the species of fishes (28000), amphibians (4780), reptiles (7150) and mammals (4650).

PROCESS AND SIGNIFICANCE:

The approach to studying biodiversity is a complete process, as one has to take into account a number of variables like where biodiversity is, how it is changing over space and time, the drivers responsible for such change, the consequences of such change for ecosystem services and human well being and response options available. In spite of many tools and data sources, biodiversity remains difficult to quantify precisely.

We did the biodiversity assessment of the Tadoba National Park and Bor Tiger Reserve. and the data has been presented in this report.

TOUR ITINERARY

- 23rd February,2020: Left Howrah station by train, Gitanjali express (12860) at 1:40 PM for Nagpur.
- 24th February,2020: Reached Nagpur at morning. Transport to Tadoba. Stayed overnight at Tadoba
- 25th February,2020: Educational fieldwork throughout the day. Stayed overnight at Tadoba.
- 26th February,2020: Set off for Bor in the morning. Stayed overnight at Bor.
- 27th February,2020: Educational fieldwork throughout the day. Stayed overnight at Bor.
- 28th February,2020: set off for Nagpur at early morning to board train. Azad Hind Express (12129) at 10:10 AM.
- 29th February,2020: Reached Howrah in noon.

ACCOMODATION:

1. Tadoba Andhari Tiger Reserve government rest house.

2. Bor Tiger Reserve government cottage

ACCOMPANIED BY:

1. **Prof. Swagata Chattapadhyay**
2. **Sri. Sunil Kumar Pramanik**

THE GROUP PHOTO OF THE ZOOLOGY HONOURS STUDENTS ALONG WITH THE TEACHERS IN-CHARGE FOR THE EXCURSION

MATERIALS AND METHODS

In order to study the ecosystem and Biodiversity of the two National park and Sanctuary we went to the following activities are performed.

- Assessment of Abiotic Components
- Assessment of Biotic Components

❑ASSESSMENT OF ABIOTIC COMPONENTS

➢Measurement of air temperature :

A laboratory thermometer graduated in Centigrade scale (Celsius scale) was used for the purpose. The thermometer was held in mid air and the temperature was recorded.

➢Measurement of pH of soil sample:

50 gram of soil sample was taken in a Petri- dish and 10ml of water was added to it. Such that the soil was partially wet. A pH paper was taken and it was dipped in the soil sample mixed with water and the pH value was recorded.

MATERIALS AND METHODS

❑ASSESMENT OF BIOTIC COMPONENTS

➢Safari:

Jungle Safari can also be defined as a forest trail, except that instead of walking, hiking, one can also get the option of exploring the forest regions via jeep or an Elephant or a Horse. The Jungle Safari not only involves exploring a particular region of a jungle but also National Parks and Wildlife Sanctuaries as well as protective reserves.

We need to carry Binoculars (Olympus), Cameras (Canon IXUS 185 digital camera, Canon EOS 3000D digital Camera), notepad and pens for the purpose. The forest tourist guides and our teacher professor Swagata Chattopadhyay helped us to identify the various fauna we observed. Also used literature sources like "BIRDS OF THE INDIAN SUBCONTINENT" by Richard Grimmett for identification of many Birds. We recorded the names, number of individuals seen and also photographed them. These details were used to calculate the diversity indices

MATERIALS AND METHODS

➢ PITFALL TRAPS

Pitfall trapping is a sampling technique which is widely used in studies of seasonal occurrence, to examine spatial distribution patterns, to compare relative abundance in different micro-habitats, to study daily activity rhythms, and in community surveys, of various organisms.

➢STRUCTURE AND COMPOSITION:

Pitfall traps come in a variety of sizes and designs. They come in two main forms; Dry and wet pitfall traps. Dry pitfall traps consists of a container the ground with its rim at surface level use to trap mobile animals that fall into it. Wet pitfall traps are basically the same but contain a solution designed to kill and preserve the trapped animals. The fluids used in these traps are formalin (10% formaldehyde), methylated spirits, alcohol, Ethelene glycol, trisodium phosphate, picric acid, or even plain water. A little amount of detergent is added to break the surface tension of the liquid to promote quick drowning. The opening is usually cover with a lid. This is done to reduce the amount of rain and debris entering the trap and to prevent animals in dry traps from drowning or over heating as well as to keep out predators. Traps may also be baited. Baits of varying specificity can be used to increase the capture rate of a target species or group by placing them in above or near the trap. Examples of baits includes meat, dung, fruit , sugar and pheromons.

MATERIALS AND METHODS

APPARATUS USED

- Small garden shovels
- Measuring tape
- Spatula
- Small equal sized containers for in-situ organism trapping
- Soap/Detergent water
- Edible sugar to lure the organisms into the traps
- Forceps
- Blotting paper
- Ethanol
- Measuring cylinder
- Distilled water
- Large container for storage of organisms collected

MATERIALS AND METHODS

PROCEDURE

For the collection of invertebrate specimens, wet pitfall traps are advisable. The wet pitfall traps we used consisted of a small plastic container set in a cavity dug into the earth. The container contained soap water for partial immobilization of invertebrate organisms that happened to topple into it. 4 such containers each of equal size were set one at each corner of a square of side 1 m and 1 container placed at the centre. The traps were left as such for 24 hours for collection of organisms.

The organisms thus collected were then removed from the soap water and soaked on a blotting paper. Then they were placed in 70% ethanol taken in another container for preservation. The invertebrate specimens thus collected generally consisted of a diversity of ants, spiders etc. Our teachers Professor Swagata Chattopadhyay helped us to identify the organisms collected. We also used literature sources like “Introduction To The Study Of Insects”, Borror and DeLong and the number of individuals of each type of organism was recorded and the data was obtained was used to calculate the Biodiversity Indices of organisms. Also, the organisms collected were photographed under an electronic magnifier.

MATERIALS AND METHODS

➢USES:

❑PITFALL TRAPS CAN BE USED FOR VARIOUS PURPOSES:

- Collectors and researchers of various ground dwelling Arthropod species may use pitfall traps to collect the animals they are interested in. This can be done with or without bait.
- When used in series these traps may also be used to estimate species richness and abundances and this combined information may be used to calculate biodiversity indices.

➢PROBLEMS:

There are inevitably biases in pitfall sampling when it comes to comparison of different group of animals and different habitats in which the trapping occurs. An animal's trap ability depends on the structure of it's habitat. Gullan and Cranston (2005) recommend measuring and controlling for such variations. Intrinsic properties of the animals itself also effect it's trap ability some taxa are more active than others, more likely to avoid the trap, less likely to be found on the ground or too large to be trapped.

MATERIALS AND METHODS

NOTE: The death of the huge number of Biological Entities, who sacrificed their lives as we executed our project by pitfall trap technique, who had an equal say in determining the biodiversity coefficient of the area, is highly regretted

Measurement of the corners of the square of length 1m

Digging small pits in the earth for the containers to fit in

Containers arranged on the corners of the square for pitfall trap

MATERIALS AND METHODS

- ➢ **QUADRAT:**

❖PRINCIPLE:

When an ecologist wants to know how many organisms there are in a particular habitat, it would not be feasible to count them all. Instead , he or she would be forced to count a smaller representative part of the population, called a sample. Sampling of plants or animals that do not move much (such as snails), can be done using a sampling square called quadrat. A suitable size of quadrat depends on the size of the organisms being sampled. For example, to count plants growing on a school field, one could use a quadrat with sides 0.5 or 1 meter in length.

❖APPARATUS USED:

1. Small garden shovels.
2. Forceps
3. Measuring tape
4. Insect pins
5. A kill jar container 70% alcohol
6. Ziplock packets and plastic containers
7. Labels
8. Iron poles
9. String
10. Magnifying glass
11. Newspaper for collection

MATERIALS AND METHODS

❖ METHOD:

A suitable site was selected for the quadrat work to be done. An area of 1sq m was measured and the region was demarcated with the help of a string. The string was fixed in a square form of 1mx1m and the corners were fixed with iron poles. Thus the quadrat was formed and various species of flora and fauna were collected with the help of forceps.

DIVERSITY INDEX

- INTRODUCTION:

A diversity index is a mathematical measure of species diversity in a community. Diversity indices provide more information about community composition than simply species richness. They also take the relative abundance of different species into account. When diversity indices are used in ecology the types of interest are usually species, they can also be other categories, such as genera, families, functional types or haplotypes.

- TYPES:

Many kinds of diversity indices can be used to study a community diversity. We have used the Shannon- Weiner index.

- IMPORTANCE:

Diversity indices provide important information about rarity and commonness of species in a community. The ability to quantify diversity in this way is an important tool for biologists trying to understand community structure

SOME IMPOTANT TERMINOLOGIES

○ SPECIES RICHNESS:

Species richness is the number of different species represented in an ecological community, landscape or region. It is simply a count of species, and it does not take into account the abundances of the species or the relative abundance distribution

○ SPECIES EVENNESS:

It refers to how close in numbers each species in an environment is.

○ SPECIES DOMINANCE:

It gives an idea about the species whose population is highest In the community.

❑ SHANNON – WINER INDEX:

It was proposed by Claude Shannon,1948. it is a measure of uncertainty. It was brought into ecology by Robert Mac Arthur. It has no unit. It is only meaningful when we compare it that of some other ecosystem. The idea behind this index is that the diversity of a community is similar to the amount of information in a code or massage. It is calculated in the following way :

$$H' = -\sum pi \ln pi$$

Where pi is the proportion of individuals found in species i . For a well sampled community we can estimate this proportion as pi values will be between 0 and 1, natural log makes all of the terms of the summation negative, which is why we take the inverse of the sum.

INTERPRETATION:

Typical values are generally between 1.5 and 3.5 in most ecological studies, and the index is rarely greater than 4. The Shannon- Weiner index. Increases as both the richness and the evenness of the community increase. The fact that the index incorporates bot components of biodiversity can be seen as both strength and weakness. It is a strength because it provides a simple, synthetic summery, but it is a weakness as it makes it difficult to compare communities that differ greatly in richness.

Higher the value of Shannon- Weiner index greater is the uncertainty. Lower the Shannon- Weiner index more is the dominance. For calculation of species evenness(J) we use the formula,

$$J = H' / \ln S$$

Where S is the total number of species in the community.

TADOBA ANDHARI TIGER RESERVE

DATE OF ARRIVAL: 24TH February ,2020
TIME OF ARRIVAL: 1:00 pm
EVENTS: 1. Morning safari
2. Evening safari
3. Field work
DATE OF DEPARTURE: 26th February, 2020
TIME OF DEPARTURE: 9:00 am

HIGHLIGHTS

The Tiger Reserve is situated in the core area of the forest.

- **LOCATION: Chandrapur, Maharashtra, India.**
- **One of the largest and oldest National Park.**
- **February to May is the best time to visit.**
- **SEASONS: Summer (February to July with temperature 30◦ - 47◦ C.**

Monsoon (mid June to October)

Winter (November to the end of January with minimum temperature of 9◦ C.

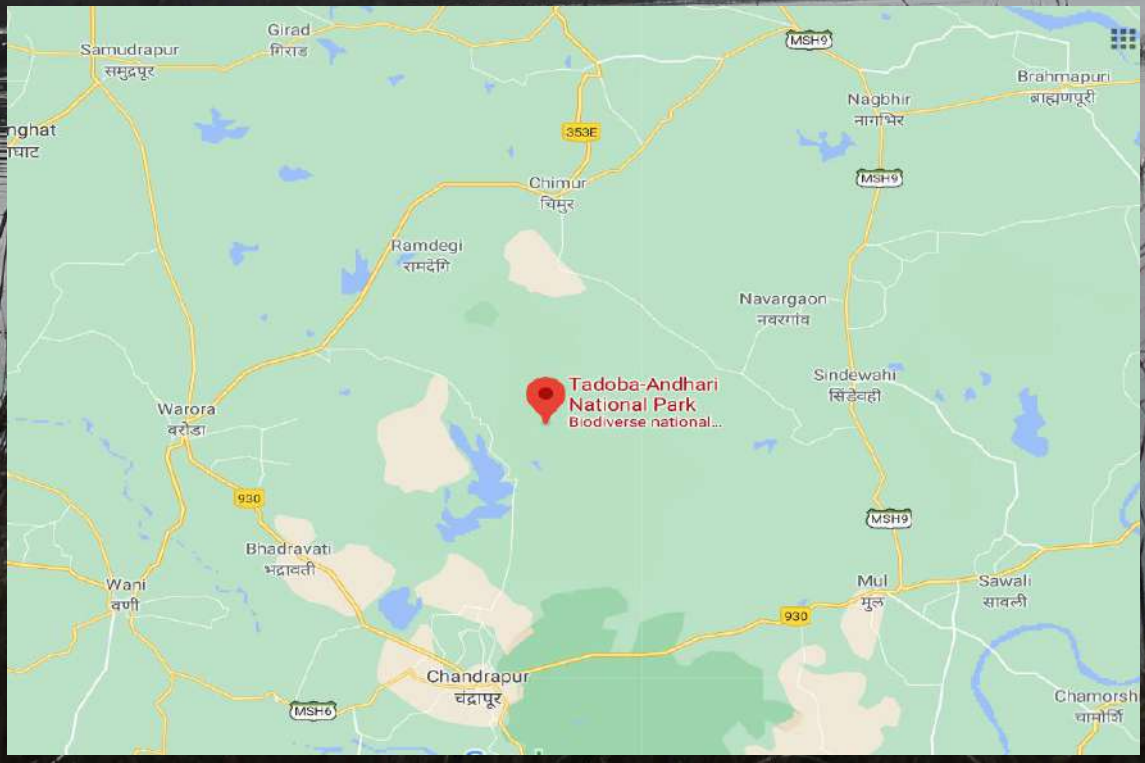
- **RAINFALL: 1175 mm annually slight rain also occurs in October/ November brought by North East wind.**
- **WATER SOURCES: tadoba river, Tadoba lake, Kolsa lake.**

Morning safari

Into the wilderness

LOCATION

The area of the Tadoba Andhari Tiger Reserve falls in the 20◦ 25’ 50” – 20◦ 04’ 53” N latitude and 79◦ 33’ 34” East longitude. The entire area comes under the district of Chandrapur of Maharashtra state and involves Chandrapur, Bhadrawati, Chimur, Warora and Sindewani Tahsils. It has it’s offices at Tadoba. Tadoba lies 45 Km North of the district headquarter, Chandrapur and about 200 Km, from the other main city, Nagpur. The other fair weather motorable road stations are Chandrapur and Warora on the central railway. The nearest airport is Nagpur. Terrain of Tadoba Andhari Tiger Reserve is undulating with gently rolling hills covered with dry deciduous forest.



HOW TO REACH TO TADOBA

Nagpur can be reached from New Delhi 125 hours flight service. Flight services ply between major metros and Nagpur.

Nagpur is connected with all major cities of India by rail. State buses ply to various destinations while luxury buses are available for travel to Jabalpur in Madhya Pradesh.

Nagpur to Mohurli gate – 180 Km via Chandrapur.

Nagpur to Kuswanda gate – 140 Km via Chandrapur.

Nagpur to Kolara gate - 120 Km via Chandrapur.

Nagpur to Navegaon gate – 140 Km via Chandrapur.

Nagpur to Pangdi gate – 250 Km via Chandrapur.

Nagpur to Zari gate – 190 Km via Chandrapur.

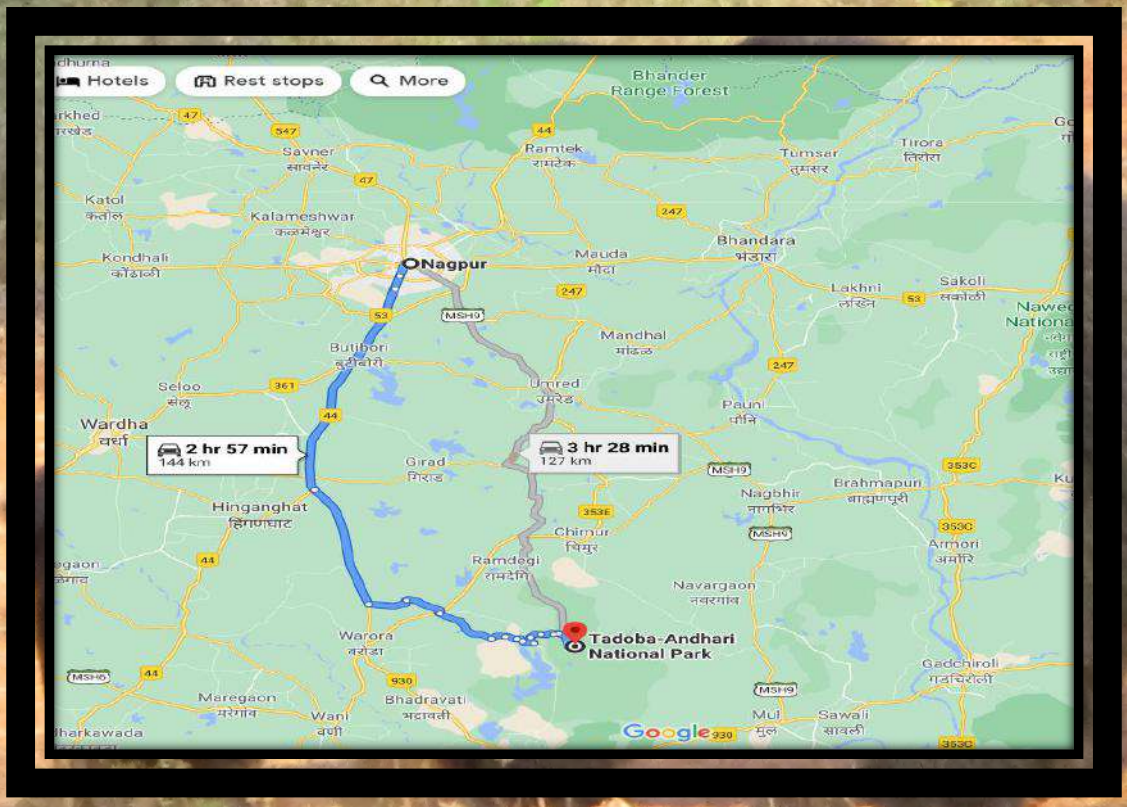
From Jabalpur to Nagpur – 280 Km.

Nagpur to Chandrapur – 100 Km.

Pench to Nagpur – 80 Km.

GATES TO TADOBA

1. Moharli gate
2. Kuswanda gate
3. Kolara gate
4. Navegaon gate
5. Pangdi gate
6. Zari gate



Road map from Nagpur city to Tadoba National Park

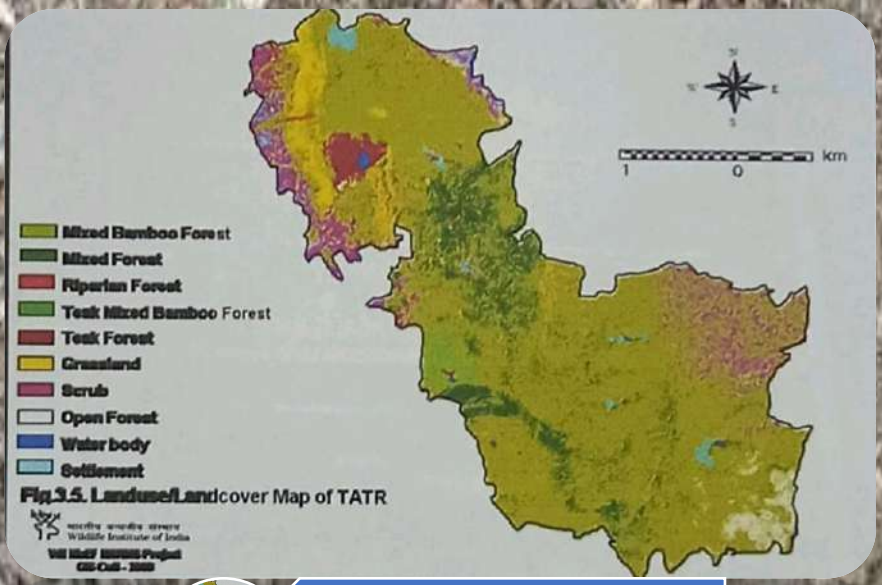
A picture of bird watching tower in Tadoba

GEOLOGICAL DIVERSITY

Vindhyan sand stones occur in almost all of the area which consists of sandstones, shales and lime stone. The shale is intercalated with limestone. The prominent rocks are the grained vitreous sandstone. Broad geological divisions can be made for Tadoba Andhari Tiger Reserve based on the disposition of the rock types. In North, a small patch of detrital mantle consists of alluvial deposits.

In South Western site the Gondwana sediments expose Kamathi formation and Lamteas at surface. Archaean metamorphic rocks as patches are present along the north east corner and in the Western border. The soil in the greater part is sandy with stretches of yellow brown and black loam.

The black cotton soil is found in the plains except where the forest are heavily degraded. On the slopes the soil layer is thin and vegetation is sparse. The tops of the hillocks are mostly barren with exposed rocks.



Geological diversity map of Tadoba Andhari Tiger Reserve

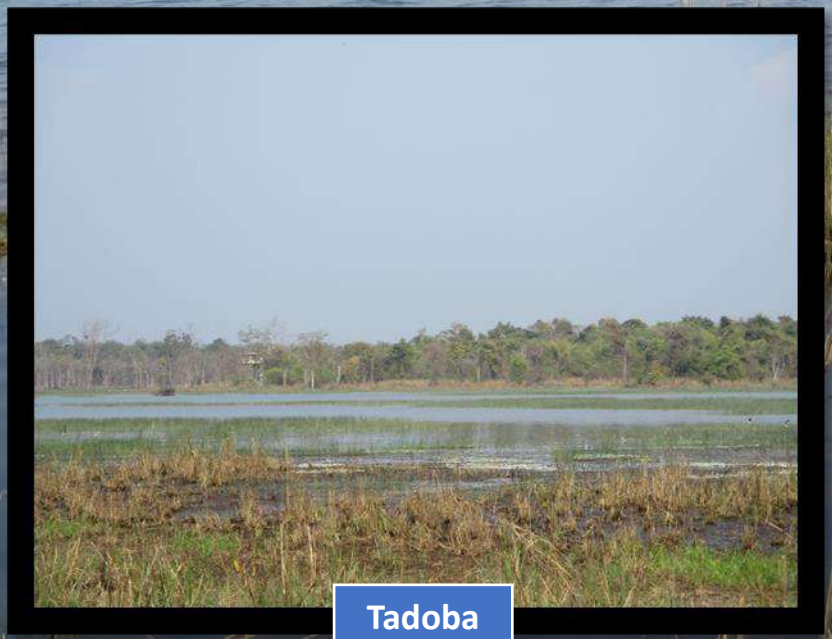
DRAINAGE AND WATER BODIES IN TADOBA

Tadoba is gifted with the centrally located magnificent 120 hectare, perennial natural water body. Tall and evergreen Jamun trees border this large reservoir and provide good nesting sites for a variety of birds. A good road runs along the periphery of this lake offering and excellent opportunity for ornithologist and wildlife observers. The rest houses in Tadoba are located in the Eastern bank of this graceful water body.

Andhari is the main river in the area. It originates from Pandharpauni in the Tadoba National Park and flows Southwards to join the river Wainganga. The portion of this river towards the South of Dewada-Kolsa road is perennial, whereas during it's course between Jamin and Dewad-Kolsa retain waters at pockets, which are termed "Dohs". Bhhanukundi nalla originates from Katezari in the Tadoba National Park and joins Erai river.

In addition to this streams and rivers as many as 10 large water tanks are available in the protected area, which are permanent water source. These tanks help in maintaining the water in pockets of downstream through seepage.

Besides these 7 more water tanks are available to quench the thirst. In spite of these water sources water remains scarce commodity particularly hot months of the year. Several water troughs especially constructed for use of wildlife have to be regularly filled in artificially. A tank of moderate size is also available at joining the rest house at Kolsa.



Tadoba Lake

PHOTOS OF THE JUNGLE

1. FOREST ECOSYSTEM:

Sited of Junona and Agarzari zone

2. GRASSLAND ECOSYSTEM

Sites of Agarzari and Junona zone

3. AQUATIC ECOSYSTEM

Sites of Junona and Agarzari zone

ENVIRONMENTAL ANALYSIS

➢MEASUREMENT OF AIR TEMPERATURE:

- Date : 26.02.2020 – 27.02.2020
- Temperature at 6:45 pm: 17.5◦C
- Temperature at 8.45 am: 23◦C

➢MEASUREMENT OF PH OF SOIL SAMPLE:

- The soil collected from the area where we set the pitfall traps was used for PH analysis.
- Date of measurement: 26.02.2020 – 27.02.2020
- PH value: 7.3

➢ COMMENTS:

Temperature are found to be moderate. The soil of the forested area was found to be alkaline. This indicates that the area has mostly clay soil with poor structure and low infiltration capacity. The soil has a low concentration of micronutrients.

FLORA OF TADOBA-ANDHARI TIGER RESERVE

- Teak, Ain, Bija, Haldi, Dhaoda, Bamboo, Haldu, Arjun, Tendu, Salai, Jamun, Semal, Beheda, hirda Karayagum and Lanneacoramandelica (Wodier tree), Black Plum trees, etc are found in Tadoba-Andhari Tiger Reserve.

ZOOLOGICAL DIVERSITY

- The Tadoba Andhari Tiger Reserve is very rich in faunal diversity. Among the many kinds of organisms found in Tadoba some are listed below as follows.

BIRDS

Serial no.	Common Name	Scientific Name
1.	Grey Jungle Fowl	*Gallus sonneratii*
2.	House Sparrow	*Passer domesticus*
3.	Spotted Dove	*Spilopelia chinensis*
4.	Black Drongo	*Dircurus macrocercus*
5.	Little egret	*Egretta garzetta*
6.	Rufous treepie	*Dendrocitta vagabunda*
7.	Jungle babbler	*Turdoides striata*
8.	Crested serpent eagle	*Spilornis cheela*
9.	Red vented bulbul	*Pycnonotus cafer*
10.	Common starling	*Sturnus vulgaris*
11.	Shikra	*Accipiter badius*
12.	Black headed ibis	*Threskiornis melanocephalus*

Serial no.	Common Name	Scientific Name
13.	White throated kingfisher	*Halcyon smyrnensis*
14.	Indian spot bill duck	*Anas poecilorhyncha*
15.	Green bee eater	*Merops orientalis*
16.	Little grebe	*Tachybaptus ruficollis*
17.	Open billed stork	*Anastomus oscitans*
18.	Cotton pygmy goose	*Nattapus coromandelianus*
19.	Bronze winged jacana	*Metopidius indicus*
20.	Red wattled lapwing	*Vanellus indicus*
21.	Grey heron	*Ardea cinerea*
22.	Indian cormorants	*Phalacrocorax fuscicollis*
23.	whistling duck	*Dendrocygna sp*
24.	Lesser adjutant stork	*Leptoptilos javanicus*
25.	Grey headed fish eagle	*Ichthyophaga ichthyaetus*
26.	Glossy ibis	*Plegadis falcinellus*
27.	Yellow footed green pigeon	*Treron phoenicoptera*
28.	Peafowl	*Pavo cristatus*
29.	Peahen	*Pavo cristatus*
30.	Indian roller	*Curacias benghalensis*
31.	Magpie robin	*Copsychus saularis*
32.	Euresian thick knee	*Burhinus oedicnemus*
33.	Grey hornbill	*Ocyceros birostris*

MAMMALS

Serial no.	Common Name	Scientific Name
1.	Spotted deer	*Axis axis*
2.	Indian gaur	*Bos gaurus*
3.	Grey langur	*Semnopithecus sp.*
4.	Sloth bear	*Melursus ursinus*
5.	Tiger	*Panthera tigris*
6.	Wolf	*Canis lupus*
7.	Jackal	*Canis aureus*
8.	Wild dog	*Cuon alpines*
9.	Fox	*Vulpes sp.*
10.	Hyena	*Hyaena hyaena*
11.	Sambar deer	*Rusa unicolor*
12.	Wild boar	*Sus scrofa*
13.	Blue bull	*Boselaphus tragocamelus*
14.	Porcupine	*Hystrx indica*
15.	Rhesus macaque	*Macaca mulatta*
16.	Leopard	*Panthera pardus*
17.	Jungle cat	*Felis chaus*
18.	Rusty spotted cat	*Prionilurus rubiginiosus*
19.	Indian pangolin	*Manis sp.*
20.	Four horned antelope	*Tetracerus quadricornis*
21.	Barking deer	*Muntiacus muntjak*

TIGER AS A KEY STONE SPECIES

- A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether. A keystone species is often but not always a predator.
- Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex predator can regulate species abundance, distribution, diversity; which in turn can impact the health of terrestrial habitats.
- Additionally they provide essential food sources for the grazers and remove the sick and weak from population of prey species.
- The decimation of these important tiger species can have cascading effects throughout the ecosystem they inhabit, resulting in economically and ecologically devastating consequences.
- In Tadoba National Park the keystone species is Tiger.
- Tiger is the largest of the world's great cat. Tiger, gaur, sambar deer, chital deer, blue bull help to maintain wildlife population.

PUG MARKING

Pug mark is the term used to refer the footprint of most animals. “Pug” means foot in Hindi. Every individual animal species has a distinct pug marks used for identification of different species.

Importance of pug marks:

A. Wildlife conversationists are known to catalogue pug marks in the area they operate.
B. Pug marks are also used for tracking rogue animals which may be in danger to mankind or even to themselves because of injuries etc.
C. It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the fields.

Tigress Madhuri

Pug marks of tiger

JUNGLE SAFARIES AND FIELDWORK FOR BIODIVERSITY ASSESSMENT

We did two jungle safaris as well as field work activities such as pitfall traps in Tadoba National Park in order to have a clear idea of its bio diversity. We went for the first safari on the morning of 25th February,2020 which started at 6:00 am and ended at 10:00 am.

We went for the second safari in the afternoon of 25th February,2020 which started at 2:00 pm and ended at 6:00 pm.

We set the pitfall traps in the evening of 24th February,2020 at about 3:00pm in the Junona zone of the reserve which in itself is an ecotone area. The traps were collected after 24 hours that is, the morning of 26th February,2020 at about 7:00 am.

The data collected from all these activities has been presented in the next pages in the form of a census report.

Pictures of us taken during the morning safari

1. MORNING SAFARI

Date :25.02.2020
Zone : Junona zone
Started at: 6:00 am
Ended at: 10:00 am

Picture taken just outside the Junona zone gate

We went on the morning safari in a gypsy to the Tadoba Andhari Tiger reserve. The fauna observed and their corresponding number was recorded as follows.

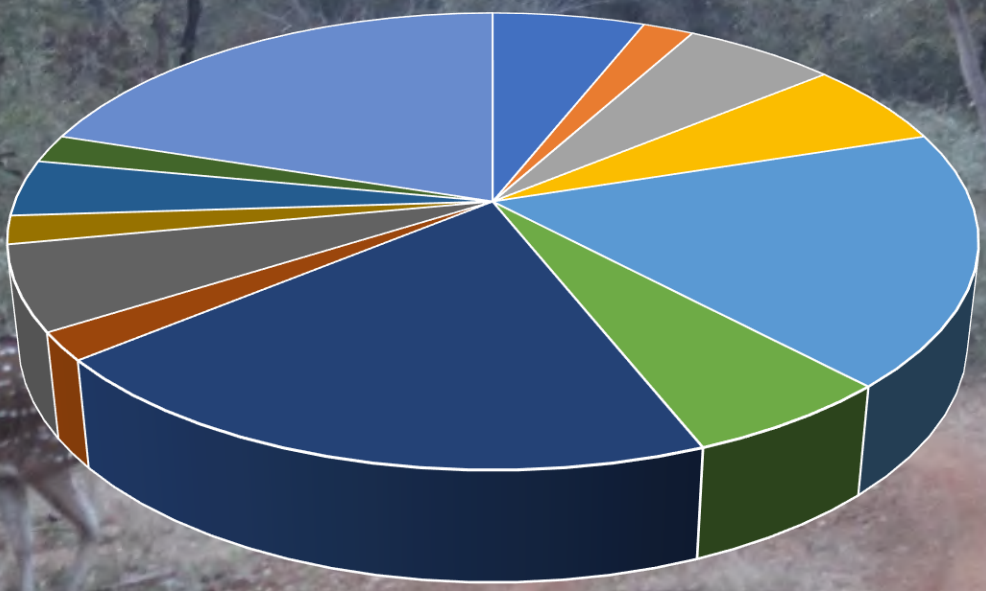
Serial number	Common Name	Scientific Name	Number of individual seen
1.	Spotted deer	*Axis axis*	17
2.	Grey jungle fowl	*Gallus sonneratii*	3
3.	House sparrow	*Passer domesticus*	1
4.	Indian gaur	*Bos gaurus*	23

Serial no.	Common Name	Scientific Name	Number of individuals seen
5.	Sotted dove	*Spilopelia chinensis*	3
6.	Black drongo	*Dircurus adsimillis*	3
7.	Little egret	*Egretta garzetta*	9
8.	Rufous treepie	*Dendrocitta vagabunda*	3
9.	Jungle babbler	*Turdoides striata*	10
10.	Crested serpent eagle	*Spilonnis cheela*	1
11.	Red vented bulbul	*Pycnonotus cafer*	3
12.	Common starling	*Sturnus vulgaris*	1
13.	Peacock	*Pavo cristatus*	2
14.	Grey langur	*Semnopithecus sp.*	1
15.	Shikra	*Accipiter badius*	1
16.	Black headed ibis	*Threskiornis melanocephalus*	10
17.	tigress	*Panthera tigris*	3

CHART REPRESENTATION OF BIODIVERSITY

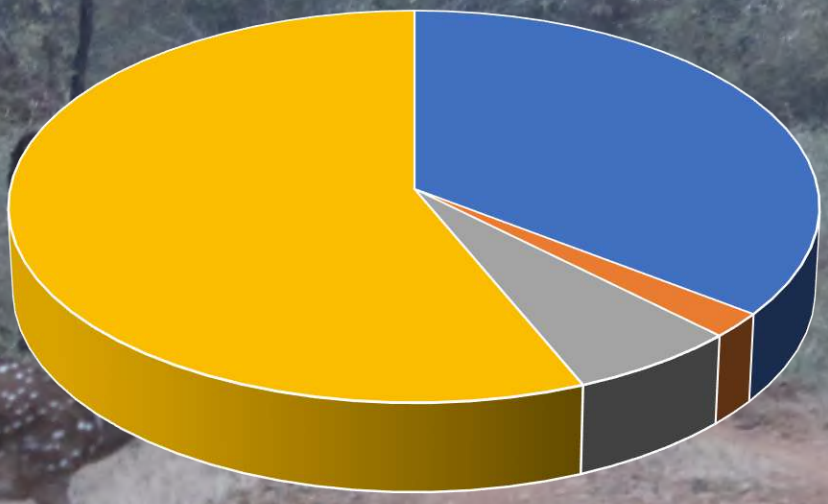
Based on the above data the fauna observed has been statistically represented as under:

Avian Fauna



On the basis of the Pie chart drawn for avian fauna we conclude that the dominant species are Jungle babbler and Black headed Ibis each represented by 10 individuals.

Mammalian Fauna



On the basis of the Pie Chart drawn for mammalian fauna we conclude that the dominant species is Indian Gaur represented by 23 individuals.

2. AFTERNOON SAFARI

- Date:25th February 2020
- Zone: Agarzari zone
- Started at: 2:00pm
- Ended at: 6:00pm

Picture taken before entering the Agarzari zone

Group picture clicked during Afternoon safari

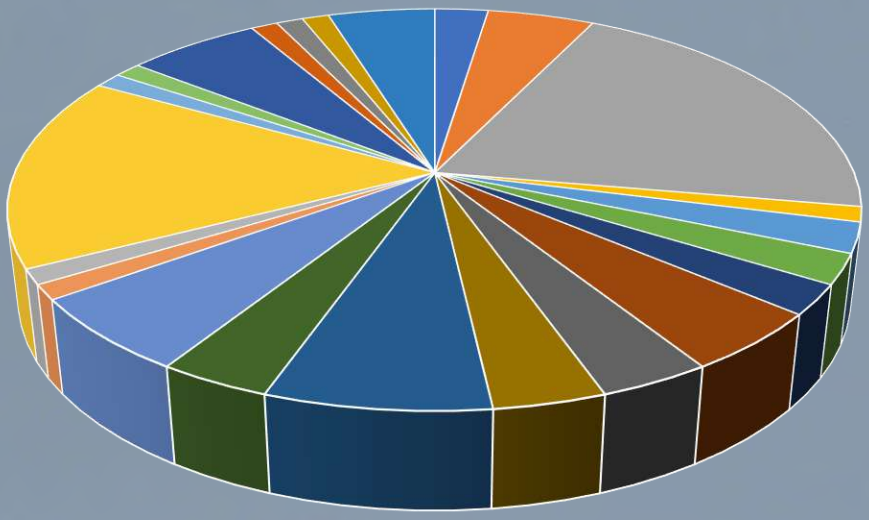
We went on the afternoon safari in a gypsy to the Tadoba Andhari Tiger Reserve. The fauna observed and their corresponding number was recorded as follows.

Serial No.	Common Name	Scientific Name	No. of individuals count
1.	White throated kingfisher	*Halcyon smynenois*	2
2.	Indian Spot billed Duck	*Anas poecilorhyncha*	2
3.	Whistling duck	*Dendrocygna* sp.	17
4.	Green bee eater	*Meros orientalis*	1

Serial No.	Common Name	Scientific Name	No. of individuals count
5.	Black drongo	*Dircurus adsimillis*	3
6.	Little grebe	*Tachybaptus ruficollis*	4
7.	Grey hornbill	*Ocyceros birostris*	2
8.	Yellow footed green pigeon	*Teron phoenicoptera*	2
9.	Red Vented Bulbul	*Pycnontus cafer*	3
10.	Open billed stork	*Anastomus oscitans*	6
11.	Grey Jungle Fowl	*Gallus sonnerattii*	3
12.	Grey Langur	*Semnopithecus sp.*	3
13.	Cotton pygmy goose	*Nettapus coromandelianus*	1
14.	Spotted deer	*Axis axis*	19
15.	Indian roller	*Coracias benghalensis*	3
16.	Indian Gaur	*Bos gaurus*	6
17.	Cattle egret	*Bubulcus ibis*	2
18.	Bronze winged jacana	*Metopidius indicus*	1
19.	Euresian thick knee	*Burhinus oedicnemus*	5
20.	Rufous treepie	*Dendrocitta vagabunda*	1
21.	Black headed ibis	*Pseudibis papillosa*	1
22.	Grey heron	*Ardea cinerea*	1
23.	Red wattled lapwing	*Vanellus indicus*	1
24.	Indian cormorants	*Phalacrocorax fuscicollis*	11
25.	Indian Pea fowl	*Pavo cristatus*	13

Serial no.	Common name	Scientific name	Number of individuals seen
26.	Magpie robin	*Copsyshus saularis*	1
27.	Barking deer	*Muntiacus muntjac*	2
28.	Sambar deer	*Rusa unicolor*	3
29.	Wild boar	*Sus scrofa*	1
30.	Sloth beer	*Melursus ursinus*	5
31.	Tiger cub	*Panthera tigris*	1
32.	Glossy ibis	*Plegadis falcinellus*	1
33.	Rose ring parakeet	*Psittacula krameria*	4
34.	Lesser adjutant stork	*Leptoptilos javanicus*	1

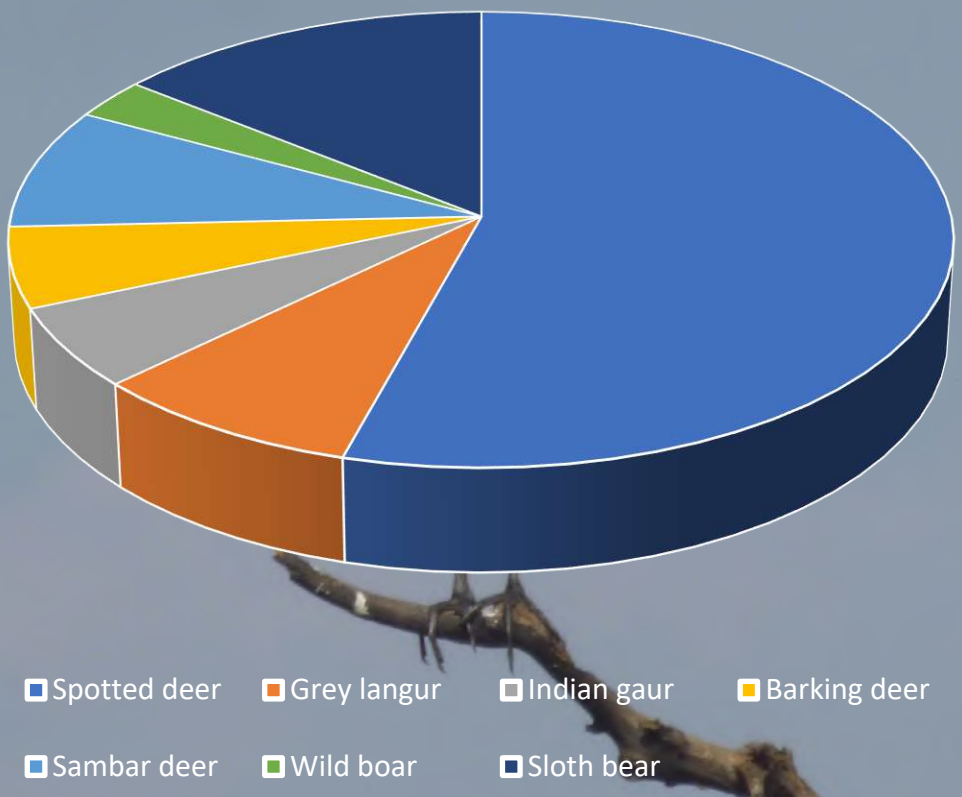
Avian Fauna



- White Throated kingfisher
- Indian Spt billed duck
- Whistling duck
- Green bee eater
- Black drongo
- Grey hornbill
- Yellow footyed green pigeon
- Little grebe
- Red vented bulbul
- Grey Jungle fowl
- Open billed stork
- Indian roller
- Eurasian thick knee
- Rufous treepie
- Black headed ibis
- Indian pea fowl
- Magpie robin

On the basis of the pie chart drawn for Avian fauna we conclude that the dominant species is whistling duct with the individuals of 17.

MAMMALIAN FAUNA



On the basis of the pie chart drawn for Avian fauna we conclude that the dominant species is Spotted deer with the individuals of 19.

3. PITFALL TRAP

❖ **Setting the traps:**

- **Date: 24.02.2020**
- **Time: 4:00pm**

❖ Collecting the traps:

- Date : 26.02.2020
- Time: 7.00am

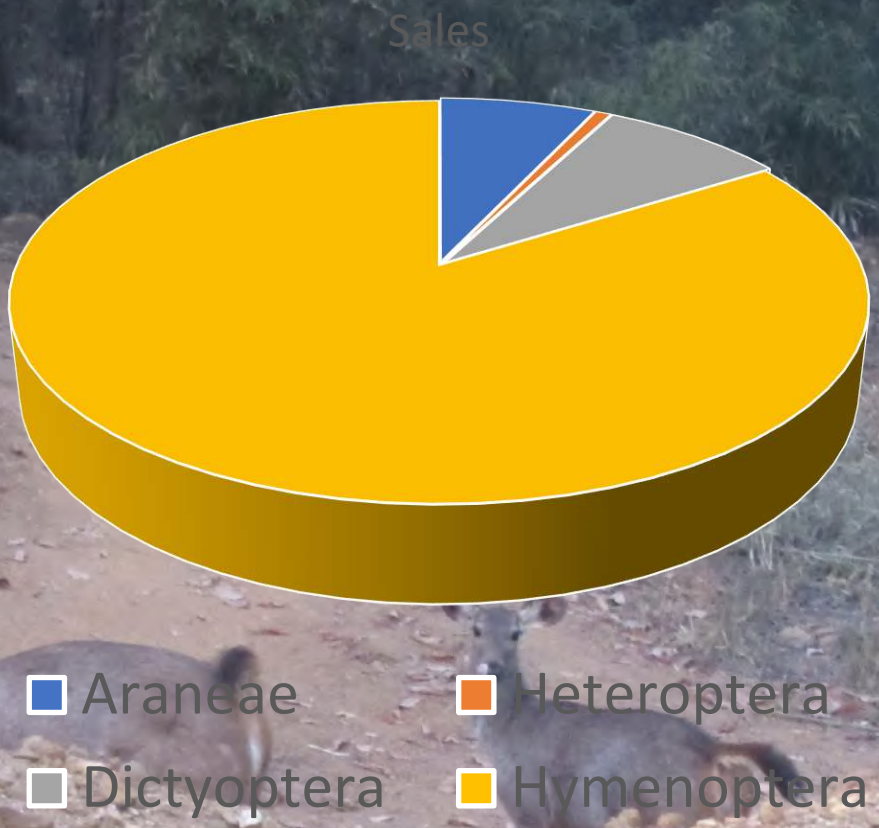



Making of pitfall traps

The different types of organisms collected in the pit fall trap technique were identified by us under the guidance of our professors and appropriate literature sources. The number of individuals belonging to different insect orders was recorded as follows:

Serial no.	Order	Number of individuals seen
1.	Araneae	10
2.	Heteroptera	10
3.	Dictyoptera	12
4.	Hymenoptera	120

INVERTEBRATE FAUNA



On the basis of the pie chart drawn for Invertebrate fauna we conclude that the dominant species is of order Hymenoptera represented by 120 individuals.

4. QUADRAT STUDY

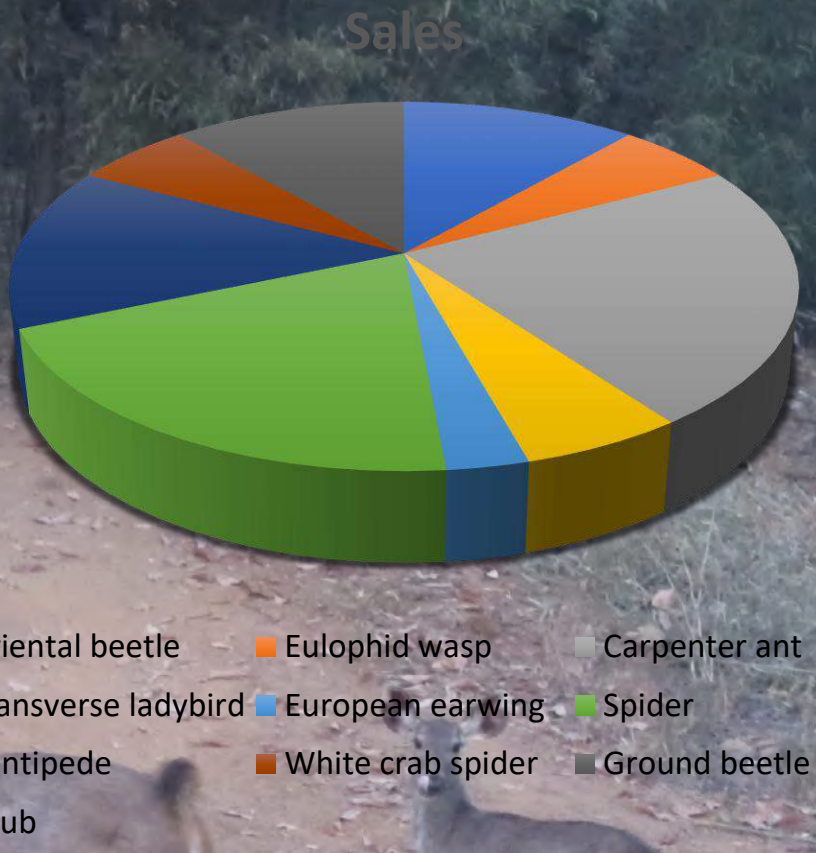
- **Date: 25.02.2020**
- **Time: 11:00am**

Collecting samples from quadrat

We did the quadrat study in Tadoba Andhari Tiger Reserve. The fauna observed and their corresponding number was recorded as follows.

Serial no.	Common name	Scientific name	Number of individuals seen
1.	Oriental beetle	*Anomela sp.*	4
2.	Eulophid wasp	*Chrysocharis sp.*	2
3.	Carpenter ant	*Camponotus sp.*	8
4.	Transverse ladybird	*Coccinella sp.*	2
5.	European earwing	*Forficula Auricularia*	1
6.	Spider(Family: Thomisidae)	*Araneae sp.*	7
7.	Centiped	*Pauropus sp.*	5
8.	White crab spider	*Thomius sp.*	2
9.	Ground beetle	*Calosoma sp.*	4
10.	Grub (larva of beetle)		5

Invertebrate Fauna



On the basis of the pie chart drawn for Invertebrate fauna we conclude that the dominant species is Carpenter ant with the individuals of 8

FAUNA OBSERVED IN SAFARI

Intermediate egret

Indian roller

Asian open billed stork

Black headed ibis

peafowl

Crested serpent eagle

Cotton pygmy goose

White eyed buzzard

Rose ring parakeet

Indian pond heron

Lesser egret

Yellow footed green pigeon

Indian gaur

Tigress

Grey langur

Tigress

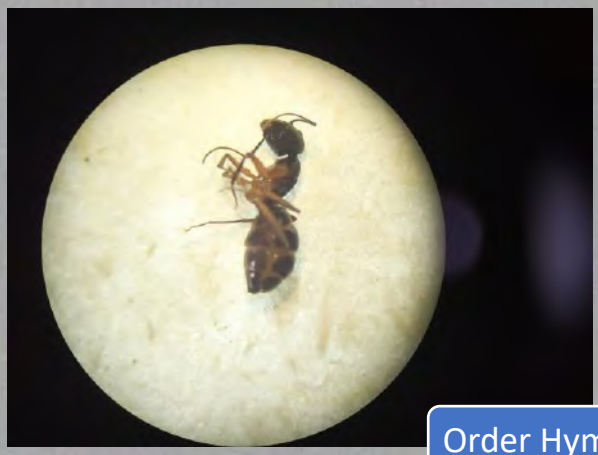
Spotted deer

Sambar deer(male and female)

A Sloth bear in search of food

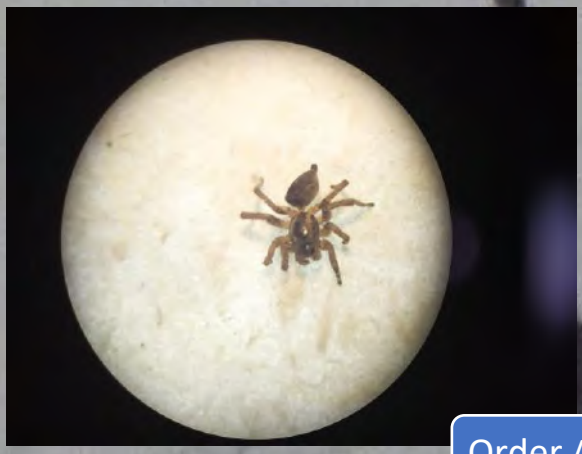
An Indian gaur(male) eating grass

SOME INVERTEBRATE FAUNA OBSERVED



Order Hymenoptera

Order Aranea



Order Arnea

CALCULATION OF THE DIVERSITY INDEX

The data obtained about the distribution of different types of fauna was used to calculate the biodiversity indices.

CALCULATION FOR THE SHANNON WEINER INDEX

The Shannon Weiner index have been calculated for the fauna observed as a whole which means a single table has been prepared for the calculations which includes the animals seen in both morning and afternoon safaris

SAFARI

AVIAN FAUNA

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
1.	Grey Jungle Fowl	6	0.0379	-3.2728	-0.1240
2.	House Sparrow	1	0.0063	-5.0672	-0.0319
3.	Spotted Dove	3	0.0189	-3.9685	-0.0750
4.	Black Drongo	5	0.0316	-3.4545	-0.1091
5.	Little egret	16	0.1012	-2.2906	-0.2318
6.	Rufous treepie	4	0.0253	-3.6769	-0.0930
7.	Jungle babbler	14	0.0886	-2.4236	-0.2147
8.	Crested serpent eagle	1	0.0063	-5.0672	-0.0319
9.	Red vented bulbul	6	0.0379	-3.2728	-0.1240
10.	Common starling	1	0.0063	-5.0672	-0.0319
11.	Shikra	1	0.0063	-5.0672	-0.0319
12.	Black headed ibis	11	0.0696	-2.6649	-0.1854

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
13.	White throated kingfisher	**2**	**0.0126**	**-4.3740**	**-0.0551**
14.	Indian spot bill duck	**2**	**0.0126**	**-4.3740**	**-0.0551**
15.	Green bee eater	**1**	**0.0063**	**-5.0672**	**-0.0319**
16.	Little grebe	**4**	**0.0253**	**-3.6769**	**-0.0930**
17.	Open billed stork	**6**	**0.0379**	**-3.2728**	**-0.1240**
18.	Cotton pygmy goose	**1**	**0.0063**	**-5.0672**	**-0.0319**
19.	Bronze winged jacana	**1**	**0.0063**	**-5.0672**	**-0.0319**
20.	Red wattled lapwing	**1**	**0.0063**	**-5.0672**	**-0.0319**
21.	Grey heron	**1**	**0.0063**	**-5.0672**	**-0.0319**
22.	Indian cormorants	**11**	**0.0696**	**-2.6649**	**-0.1854**
23.	whistling duck	**26**	**0.1645**	**-1.8048**	**-0.2968**

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
23.	whistling duck	26	0.1645	-1.8048	-0.2968
24.	Lesser adjutant stork	1	0.0063	-5.0672	-0.0319
25.	Grey headed fish eagle	1	0.0063	-5.0672	-0.0319
26.	Glossy ibis	1	0.0063	-5.0672	-0.0319
27.	Yellow footed green pigeon	2	0.0126	-4.3740	-0.0551
28.	Peafowl	15	0.0949	-2.3549	0.2234
29.	Peahen	2	0.0126	-4.3740	-0.0551
30.	Indian roller	3	0.0189	-3.9685	-0.0750
31.	Magpie robin	1	0.0063	-5.0672	-0.0319
32.	Euresian thick knee	5	0.0316	-3.4545	-0.1091
33.	Grey hornbill	2	0.0126	-4.3740	-0.0551
	TOTAL	158			-3.2507

Here $\sum$pi x ln pi =-3.2507
Therefore, Shannon Weiner Index =-(-3.2507)=3.2507
Species Evennness, J= 3.2507/ln 33=0.9296

MAMMALIAN FAUNA

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
1.	Spotted deer	36	0.4285	-0.8474	-0.3631
2.	Indian gaur	29	0.3452	-1.0636	-0.3671
3.	Tiger	4	0.0476	-3.0449	-0.1451
4.	Grey langur	4	0.0476	-3.0499	-0.1451
5.	Sloth bear	5	0.0595	-2.8217	-0.1678
6.	Barking deer	2	0.0238	-3.7380	-0.0889
7.	Sambar deer	3	0.0357	-3.3326	-0.1189
8.	Wild boar	1	0.0119	-4.4312	0.0527
	TOTAL	84			

Here $\sum pi \times \ln pi = -1.4487$

Therefore, Shannon Weiner Index $= -(-1.4487) = 1.4487$

Species Evennness, $J = 1.4487/\ln 8 = 0.6966$

Since the value of Shannon Weiner index is directly proportional to uncertainty we can predict that the uncertainty in the distribution of Avian fauna(having a higher value of 3.2507) is more than that of Mammalian ones(having lower value of 1.4487). However on the basis of values of species Evenness we can predict that Birds have more even distribution in ecosystem in comparision to Mammalian fauna.

PITFALL TRAP

INVERTEBRATE FAUNA

Serial no.	Order	ni	pi	ln pi	Pi x ln pi
1.	Araneae	10	0.0699	-2.6607	-0.1860
2.	Heteroptera	1	0.0070	-4.9618	-0.0347
3.	Dictyoptera	12	0.0839	-2.4781	-0.2079
4.	Hymenoptera	120	0.8392	-0.1753	-0.1471
	TOTAL	143			-0.5757

Here ∑pi x ln pi =-0.5757
Therefore, Shannon Weiner Index =-(-0.5757)=0.5757
Species Evenness, J= 0.5757/ln 4=0.4153

Since the value of Shannon Weiner Index is directly proportional to uncertainty, we can predict that the uncertainty in the distribution of orders of organisms collected in pit fall trap is of lower value index i.e. 0.5757. We can also predict that Arthropod orders have an even distribution.

QUADRAT

INVERTEBRATE FAUNA

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
1.	Oriental beetle	4	0.1	-2.3025	-0.2302
2.	Eulophid wasp	2	0.005	-2.9957	-0.1497
3.	Carpenter ant	8	0.2	-1.6094	-0.3218
4.	Transverse ladybird	2	0.05	-2.9957	-0.1497
5.	European earwing	1	0.025	-3.6888	-0.0922
6.	Spider(Family: Thomisidae)	7	0.175	-1.7429	-0.3050
7.	Centiped	5	0.125	-2.0794	-0.2599
8.	White crab spider	2	0.05	-2.9957	-0.1497
9.	Ground beetle	4	0.1	-2.3025	-0.2302
10.	Grub (larva of beetle)	5	0.125	-2.0794	-0.2599
	TOTAL	40			-2.1483

Here ∑pi x ln pi =-2.1483
Therefore, Shannon Weiner Index =-(-2.1483)=2.1483
Species Evenness, J= 2.1483/ln 10=0.9330

Since the value of Shannon Weiner index is directly proportional to uncertainty we can predict that the uncertainty in the distribution of Invertebrate fauna was found to of higher value of 2.1483. However, the species evenness was found to have a higher value of 0.9330, so we can say that the invertebrate species are evenly distributed in the ecosystem.

BOR TIGER RESERVE

Date of arrival: 26.02.2020
Time of arrival: 1:00pm

Events : 1.Morning safari
2.Afternoon safari

Date of departure: 28.02.2020
time of departure: 6:00am

To the wilderness

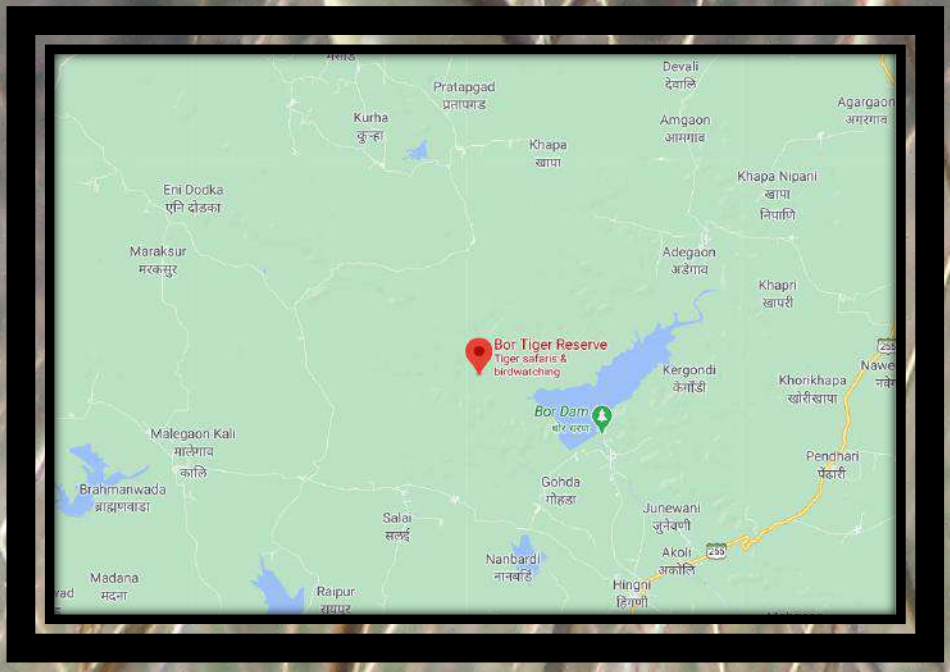
Picture clicked before going to morning safari

HIGHLIGHTS

- Bor Tiger Reserve is situated in the core area. It is the sixth tiger reserve of Maharashtra and smallest tiger reserve in India.
- February to may is the best time to visit.
- seasons:
  - summer (February to July with the temperature of 30-47°C)
  - Monsoon (Mid June to October)
  - winter (November to January with minimum temperature of 9°C)
- Best time to visit in April to May.
- Water resources: Bor dam

LOCATION

Bor Tiger Reserve is centrally located among several other Bengal tiger habitats including: Pench Tiger Reserve, Maharashtra, 90 km2 (35 sq mi) to the northeast; Nagzira Navegaon Tiger Reserve, 125 km2 (48 sq mi) to the east northeast; Umred Karhandla Wildlife Sanctuary, 75 km2 (29 sq mi) to the east southeast; Tadoba - Andhari Tiger Reserve, 85 km2 (33 sq mi) to the southeast; Melghat Tiger Reserve, 140 km2 (54 sq mi) to the west northwest and Satpura National Park and Tiger Reserve,160 km2 (62 sq mi) to the northwest.



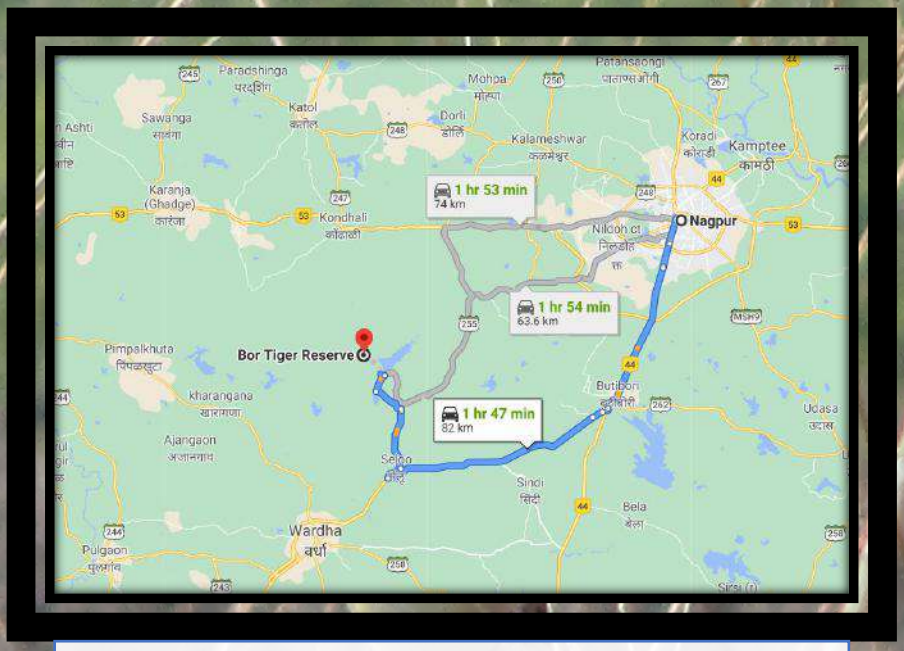
HOW TO REACH TO BOR

- To reach the Bor Tiger Reserve, one must go ahead on the Wardha-Nagpur road through MSH3 and turn North at Seloo for Hingni. From Hingni you can directly reach the visitor center at Bor Dam.

- By Air: Dr Babasaheb Ambedkar International Airport in Nagpur is closest to Bor Tiger Reserve. It is 80 km away from the sanctuary.

- By Railways: The nearest railhead, Wardha, is about 35 km away.

- By Road: The Hingni bus stand is at merely 5 km from the sanctuary. Buses arrive from and depart to Bor Wildlife Sanctuary frequently here.



Road map from Nagpur city to Bor Tiger Reserve

ZONES

- In April, 2012, the Maharashtra state government issued a notification adding 60 km2 (23 sq mi) to the old 61.1 km2 (23.6 sq mi) area of Bor Sanctuary. The new Core Zone of 115.92 km2 (44.76 sq mi) is the most protected and inviolate part of the sanctuary where the public is not allowed. It comprises 95.7% of the total area. Most of the core area is contiguous with good forest of Wardha Forest Division and Nagpur Forest Division.

- The Eco-tourism Zone of 5.21 km2 (2.01 sq mi) designated for public access for nature and wildlife tourism comprises 4.3% of the total sanctuary area. The purpose of the tourism zone is to educate the public about the significance of nature and wildlife conservation and to stimulate their environmental awareness.

- The Buffer Zone is less protected forest area near the sanctuary that serves as a protective barrier for the core area.

- The Bor Tiger Reserve is physically divided by the Bor Reservoir into 2 sections, previously; 2/3 (40 km2 (15 sq mi)), as the west part and 1/3 (21 km2 (8.1 sq mi)), as the eastern part. 95% of the western part is in Wardha district and 90% of the eastern part is in Nagpur district. The Bor Reservoir area is about 7.25 km2 (2.80 sq mi) and is not included in the total sanctuary area.

PICTURE OF ECOSYSTEMS

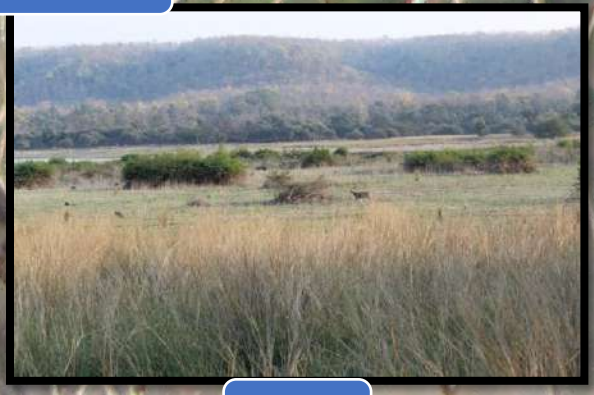
FOREST ECOSYSTEM

Site 1

Site 2

GRASSLAND ECOSYSTEM

Site 1



Site 2

AQUATIC ECOSYSTEM

Site 1

Site 2

ENVIRONMENTAL ANALYSIS

➢MEASUREMENT OF AIR TEMPERATURE:

Date : 27.02.2020

Temperature at 5:30 am: 17.2◦C

Temperature at 7.40 pm: 26.5◦C

➢MEASUREMENT OF PH OF SOIL SAMPLE:

The soil collected from the area where we stayed at night and the PH sample was analysed

Date of measurement: 27.02.2020

PH value: 7.8

➢ COMMENTS:

Temperature are found to be moderate. The soil of the forested area was found to be alkaline. This indicates that the area has mostly clay soil with poor structure and low infiltration capacity. The soil has a low concentration of micronutrients.

FLORA OF BOR TIGER RESERVE

The Bor Tiger Reserve is populated by Dry Deciduous Forest type. Teak, Tikur, Bamboo, Tarot, Gokhru are some of the abundant species.

ZOOLOGICAL DIVERSITY

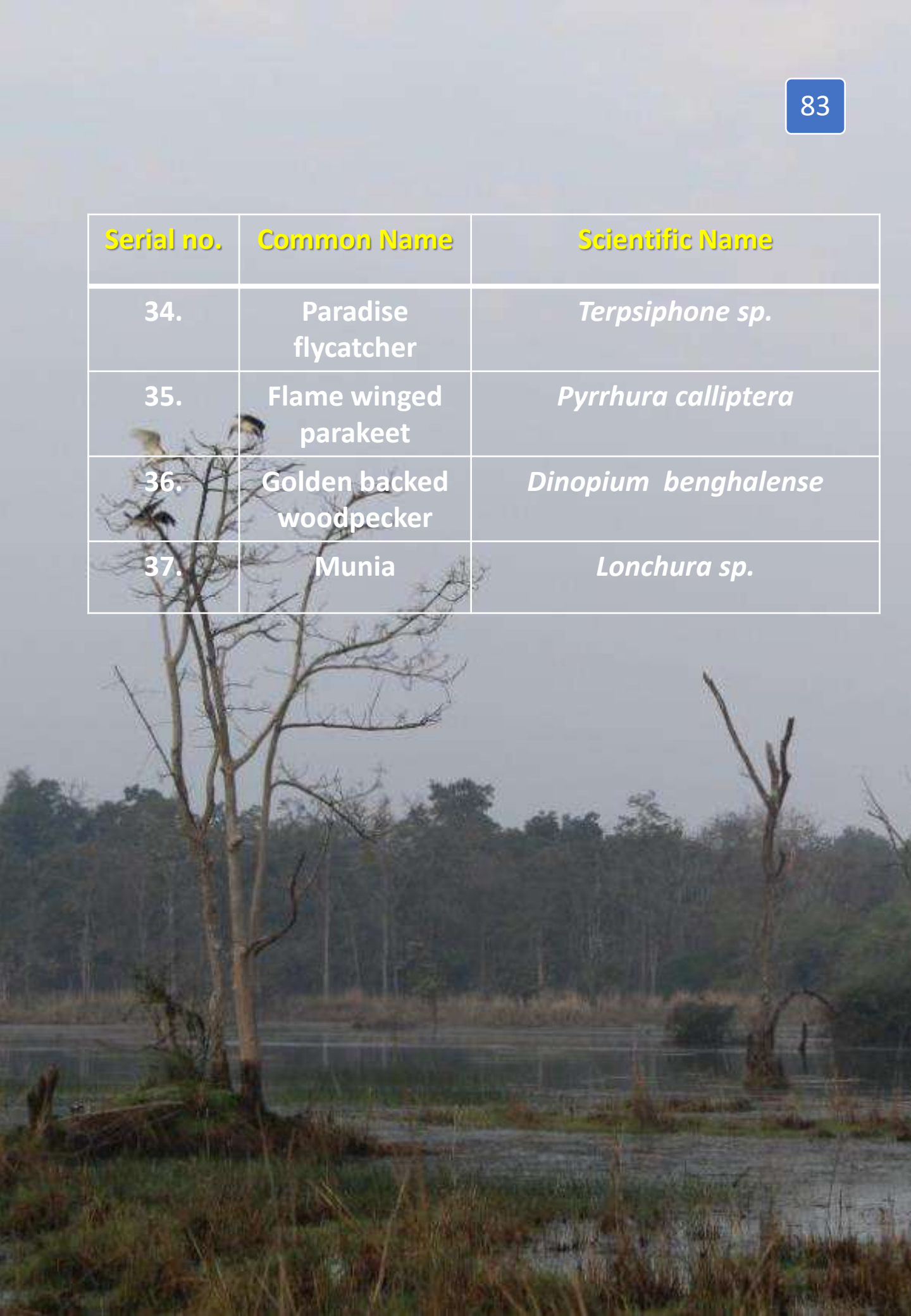
- The Tadoba Andhari Tiger Reserve is very rich in faunal diversity. Among the many kinds of organisms found in Tadoba some are listed below as follows.

BIRDS

Serial no.	Common Name	Scientific Name
1.	Grey Jungle Fowl	*Gallus sonneratii*
2.	House Sparrow	*Passer domesticus*
3.	Spotted Dove	*Spilopelia chinensis*
4.	Black Drongo	*Dircurus macrocercus*
5.	Little egret	*Egretta garzetta*
6.	Rufous treepie	*Dendrocitta vagabunda*
7.	Jungle babbler	*Turdoides striata*
8.	Crested serpent eagle	*Spilornis cheela*
9.	Red vented bulbul	*Pycnonotus cafer*
10.	Common starling	*Sturnus vulgaris*
11.	Shikra	*Accipiter badius*
12.	Black headed ibis	*Threskiornis melanocephalus*

Serial no.	Common Name	Scientific Name
13.	White throated kingfisher	*Halcyon smyrnensis*
14.	Indian spot bill duck	*Anas poecilorhyncha*
15.	Green bee eater	*Merops orientalis*
16.	Little grebe	*Tachybaptus ruficollis*
17.	Open billed stork	*Anastomus oscitans*
18.	Cotton pygmy goose	*Nattapus coromandelianus*
19.	Bronze winged jacana	*Metopidius indicus*
20.	Red wattled lapwing	*Vanellus indicus*
21.	Grey heron	*Ardea cinerea*
22.	Indian cormorants	*Phalacrocorax fuscicollis*
23.	whistling duck	*Dendrocygna sp.*
24.	Lesser adjutant stork	*Leptoptilos javanicus*
25.	Grey headed fish eagle	*Ichthyophaga ichthyaetus*
26.	Glossy ibis	*Plegadis falcinellus*
27.	Yellow footed green pigeon	*Treron phoenicoptera*
28.	Peafowl	*Pavo cristatus*
29.	Peahen	*Pavo cristatus*
30.	Indian roller	*Curacias benghalensis*
31.	Magpie robin	*Copsychus saularis*
32.	Euresian thick knee	*Burhinus oedicnemus*
33.	Grey hornbill	*Ocyceros birostris*

Serial no.	Common Name	Scientific Name
34.	Paradise flycatcher	*Terpsiphone sp.*
35.	Flame winged parakeet	*Pyrrhura calliptera*
36.	Golden backed woodpecker	*Dinopium benghalense*
37.	Munia	*Lonchura sp.*



MAMMALS

Serial no.	Common Name	Scientific Name
1.	Spotted deer	*Axis axis*
2.	Indian gaur	*Bos gaurus*
3.	Grey langur	*Semnopithecus sp.*
4.	Sloth bear	*Melursus ursinus*
5.	Tiger	*Panthera tigris*
6.	Wolf	*Canis lupus*
7.	Jackal	*Canis aureus*
8.	Wild dog	*Cuon alpines*
9.	Fox	*Vulpes sp.*
10.	Hyena	*Hyaena hyaena*
11.	Sambar deer	*Rusa unicolor*
12.	Wild boar	*Sus scrofa*
13.	Blue bull	*Boselaphus tragocamelus*
14.	Porcupine	*Hystrx indica*
15.	Rhesus macaque	*Macaca mulatta*
16.	Leopard	*Panthera pardus*
17.	Jungle cat	*Felis chaus*
18.	Rusty spotted cat	*Prionilurus rubiginiosus*
19.	Indian pangolin	*Manis sp.*
20.	Four horned antelope	*Tetracerus quadricornis*
21.	Barking deer	*Muntiacus muntjak*

JUNGLE SAFARIES FOR BIODIVERSITY ASSESSMENT

We did two jungle safaris in Bor Tiger Reserve in order to have a clear idea of its bio diversity. We went for the first safari on the morning of 27th February,2020 which started at 7:00 am and ended at 10:00 am.

We went for the second safari in the afternoon of 27th February,2020 which started at 2:00 pm and ended at 5:30 pm.

The data collected from all these activities has been presented in the next pages in the form of a census report.

A group picture taken just outside the entry gate

1. MORNING SAFARI

- **Date :27.02.2020**
- **Zone : Bordharan zone**
- **Started at: 7:00 am**
- **Ended at: 10:00 am**

Pictures taken during the morning safari

We went on the morning safari in a gypsy to the Bor Tiger reserve. The fauna observed and their corresponding number was recorded as follows.

Serial number	Common Name	Scientific Name	Number of individual seen
1.	Spotted deer	*Axis axis*	23
2.	Grey jungle fowl	*Gallus sonneratii*	4
3.	Munia	*Lonchura sp.*	2
4.	Blue bull	*Boselaphus tragocamelus*	1

Serial no.	Common Name	Scientific Name	Number of individuals seen
5.	Sotted dove	*Spilopelia chinensis*	1
6.	Black drongo	*Dircurus adsimillis*	2
7.	Rose ring parakeet	*Psittacula krameri*	4
8.	Indian roller	*Coracias benghalensis*	6
9.	Jungle babbler	*Turdoides striata*	4
10.	Crested serpent eagle	*Spilonnis cheela*	1
11.	Indian pond heron	*Ardeola grayii*	2
12.	Indian cormorants	*Phalacrocorax carbo*	1
13.	Peacock	*Pavo cristatus*	12
14.	Grey langur	*Semnopithecus sp.*	14
15.	Green bee eater	*Merops orientalis*	1
16.	Grey heron	*Ardea cinera*	1
17.	White eyed buzzard	*Butastur teesa*	1
18.	Yellow footed green pigeon	*Ternon sp.*	4
19.	Sambar deer	*Rusa unicolor*	37

2. AFTERNOON SAFARI

- **Date:27th February 2020**
- **Zone: Bordharan zone**
- **Started at: 2:00pm**
- **Ended at: 5:30pm**

picture of us clicked during Afternoon safari

Picture taken before entering the Bordharan zone

We went on the afternoon safari in a gypsy to the Bor Tiger Reserve. The fauna observed and their corresponding number was recorded as follows.

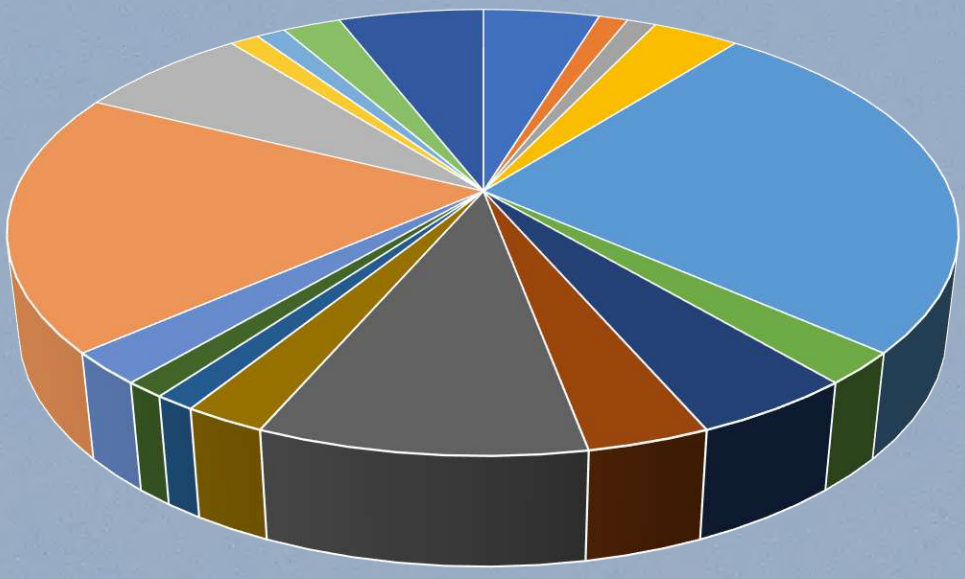
Serial No.	Common Name	Scientific Name	No. of individuals count
1.	Rose ring parakeet	*Psitacula krameri*	12
2.	Blue bull	*Boselaphus tragocamelus*	5
3.	Crested serpent eagle	*Spilornis cheela*	2
4.	Green bee eater	*Meros orientalis*	1

Serial No.	Common Name	Scientific Name	No. of individuals count
5.	Black drongo	*Dircurus adsimillis*	1
6.	Sambar deer	*Rusa unicolor*	20
7.	Wild boar	*Sus scrota*	1
8.	Yellow footed green pigeon	*Teron phoenicoptera*	4
9.	Golden back woodpecker	*Dinopium bhenghalense*	1
10.	Flame winged parakeet	*Pyrrhura calliptera*	1
11.	Grey Langur	*Semnopithecus sp.*	13
12.	Spotted deer	*Axis axis*	16
13.	Red wattled lapwing	*Vanellus indicus*	2
14.	Indian Pea hen	*Pavo cristatus*	5
15.	Indian pea fowl	*Pavo cristatus*	10

CHART REPRESENTATION OF BIODIVERSITY

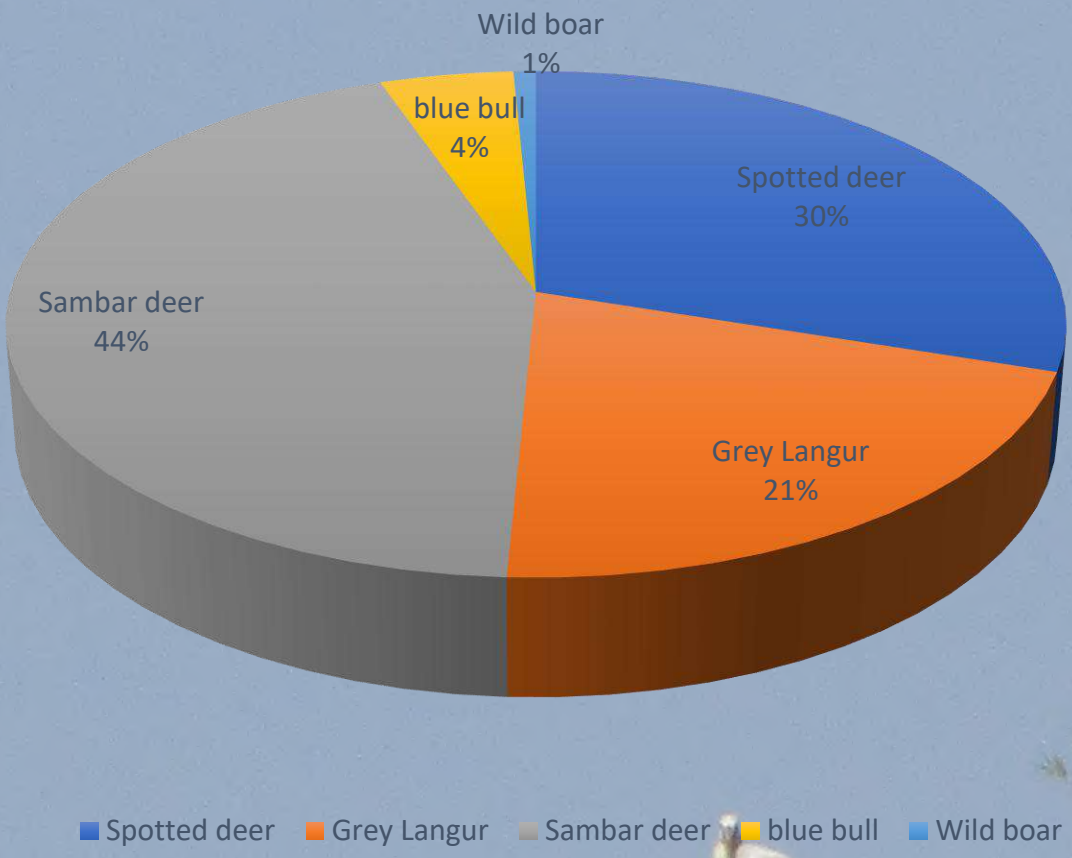
Based on the above data the fauna observed has been statistically represented as under:

Avian Fauna



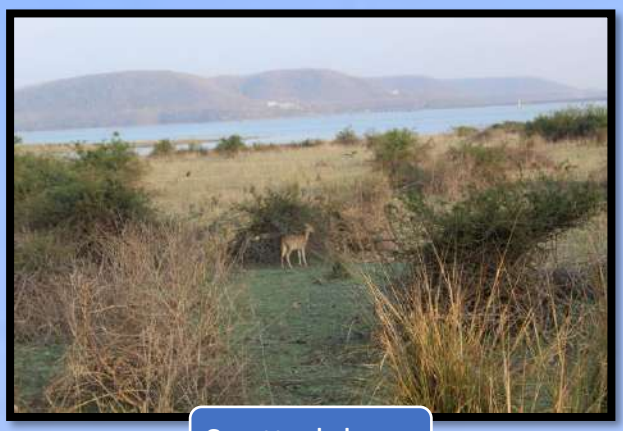
On the basis of the Pie chart drawn for avian fauna we conclude that the dominant species is Peacock with 22 individuals.

Mammalian Fauna



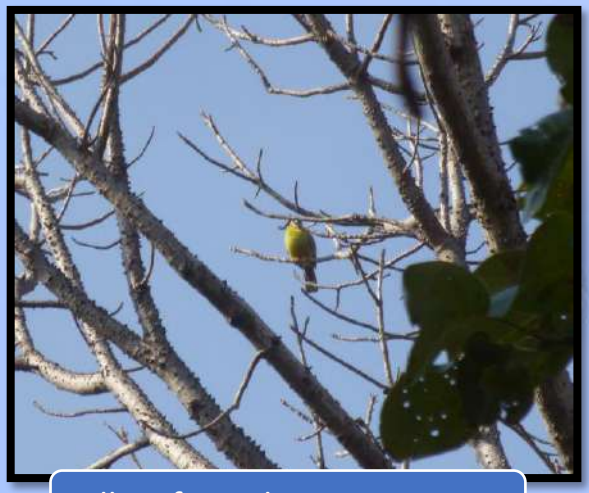
On the basis of the Pie Chart drawn for mammalian fauna we conclude that the dominant species is Sambar deer represented by 37 individuals.

FAUNA OBSERVED IN SAFARI

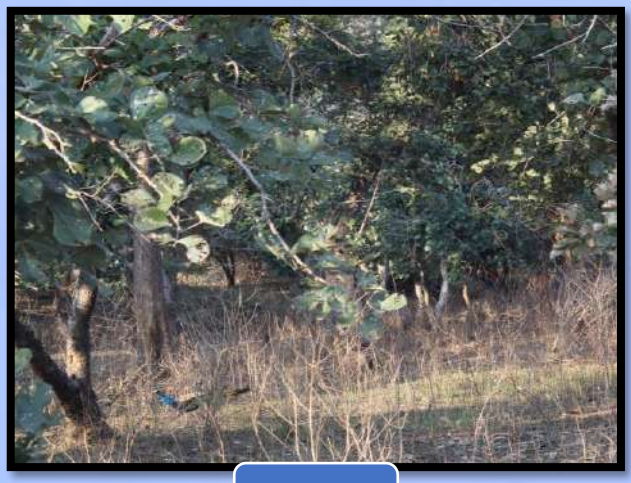


Spotted deer

Sambar deer

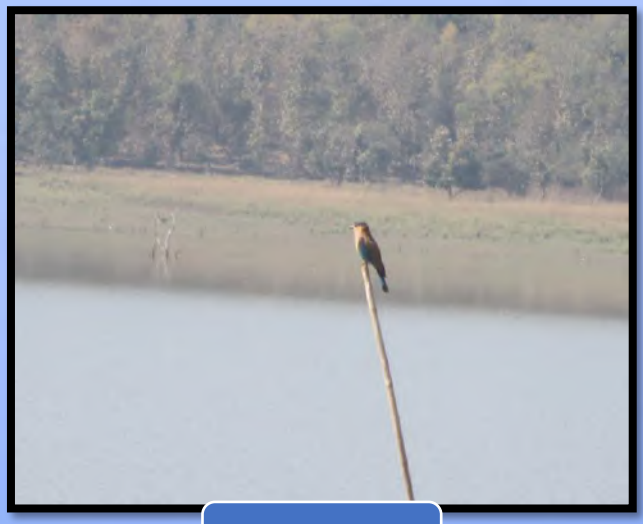


Yellow footed green pigeon



peafowl

Sambar deer



Indian roller

CALCULATION OF THE DIVERSITY INDEX

The data obtained about the distribution of different types of fauna was used to calculate the biodiversity indices.

CALCULATION FOR THE SHANNON WEINER INDEX

The Shannon Weiner index have been calculated for the fauna observed as a whole which means a single table has been prepared for the calculations which includes the animals seen in both morning and afternoon safaris

SAFARI

AVIAN FAUNA

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
1.	Grey Jungle Fowl	4	0.0470	-3.0576	-0.1437
2.	Munia	2	0.0235	-3.7507	-0.0881
3.	Yellow footed green pigeon	8	0.0941	-2.3633	-0.2223
4.	Black Drongo	3	0.0352	-3.3467	-0.1178
5.	Rose ringed parakeet	16	0.1882	-1.6702	-0.3143
6.	Indian roller	6	0.0705	-2.6521	-0.1869
7.	Jungle babbler	4	0.0470	-3.0576	-0.1437
8.	Crested serpent eagle	3	0.0352	-3.3467	-0.1178
9.	Indian pond heron	2	0.0235	-3.7507	-0.0881

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
10.	Peafowl	22	0.2588	-1.3516	-0.3497
11.	Indian cormorant	1	0.0117	-4.4481	-0.0520
12.	Green bee eater	2	0.0235	-3.7507	-0.0881
13.	Grey heron	1	0.0117	-4.4481	-0.0520
14.	White eyes buzzard	1	0.0117	-4.4481	-0.0520
15.	Golden backed woodpecker	1	0.0177	-4.4481	-0.0520
16.	Flame winged parakeet	1	0.0177	-4.4481	-0.0520
17.	Red wattled lapwing	2	0.0235	-3.7507	-0.0881
18.	Peahen	5	0.0588	-2.8336	-0.1666
19.	Spotted dove	1	0.0177	-4.4481	-0.0520
	TOTAL	85			-2.8952

Here $\sum$pi x ln pi =-2.8952
Therefore, Shannon Weiner Index =- (-2.8952)=2.8952
Species Evenness, J= 2.8952/ln 19=0.9832

Serial no.	Common Name	n_i	p_i	$\ln p_i$	$P_i \times \ln p_i$
1.	Spotted deer	39	0.3	-1.2039	-0.3611
2.	Grey langur	27	0.2076	-3.8747	-0.8043
3.	Blue bull	6	0.0461	-3.0769	-0.1418
4.	Sambar deer	57	0.4384	-0.8246	-0.3636
5.	Wild boar	1	0.0076	-4.8796	-0.0370
	TOTAL	130			-1.6772

Here $\sum pi \times \ln pi = -1.6772$
Therefore, Shannon Weiner Index =- (-1.6772)=1.6772
Species Evenness, J=1.6772 /ln 5=1.0421

Since the value of Shannon Weiner index is directly proportional to uncertainty we can predict that the uncertainty in the distribution of Avian fauna(having a higher value of 2.8952) is more than that of Mammalian ones(having lower value of 1.6772). However on the basis of values of species Evenness we can predict that Mammals have more even distribution in ecosystem in comparison to Avian fauna

MAN-WILDLIFE CONFLICT

Human-Wildlife Conflict refers to the interaction between wild animals and people and the resultant negative impact on people or their resources, or wild animals or their habitat. It occurs when growing human populations overlap with established wildlife territory, creating reduction of resources or life to some people and/or wild animals. The conflict takes many forms ranging from loss of life or injury to humans, and animals both wild and domesticated, to competition for scarce resources to loss and degradation of habitat.

OUTCOMES OF CONFLICT

Human-Wildlife conflict occurs with various negative results. The major outcomes of human-wildlife conflict are:

- ❖ Injury and loss of life of humans and wildlife.
- ❖ Crop damage, livestock and depredation, predation of managed wildlife stock.
- ❖ Damage to human property.
- ❖ Trophic cascades.
- ❖ Destruction of habitat.
- ❖ Collapse of wildlife populations and reduction of geographic ranges.

One of the initiators of the concept of man-animal conflict was Das and Guha. They described the two-sided impacts of this conflict. From one side, the source of conflict is the restriction on the local people to access forest resources. On the other side, the source of conflict is the damage incurred to them by wild animals.

SOLUTIONS FOR MAN-WILDLIFE CONFLICT

The solutions are often specific to the species or area concerned, and are often creative and simple.

An important aspect of the work is that it benefits both the animals and local human communities, and actively involves these communities. This is about finding solutions that lead to mutually beneficial co-existence.

The work has also often led to people being more enthusiastic and supportive of conservation, and has demonstrated that people can live alongside wildlife while developing sustainable livelihoods.

These include:

❖ A UNITED EFFORT

In order to be truly effective, prevention of human-wildlife conflict has to involve the full scope of society : International organizations, governments, NGOs communities, communities, consumers and individuals. Solutions are possible, but often they also need to have financial backing for their support and development.

❖ LAND-USE PLANNING

Ensuring that both humans and animals have the space they need is possible. Protecting key areas for wildlife, creating buffer zones and investing in alternative land uses are some of the solutions.

❖COMMUNITY-BASED NATURAL RESOURCE MANAGEMENT

The local community is key since they are the ones who may wake up in the morning with a tiger or bear in their backyard. But they are also the people who can benefit the most from this. If people are empowered to manage their relationship with wild animals, these “unwanted” neighbors can become allies in bringing income and promoting a better quality of life for all.

❖ COMPENSATION/ INSURANCE

Compensation or insurance for animal-induced damage is another widely accepted solution. There are different ways this can be done. In Tadoba, for example, community-based insurance system exists for damage done to livestock. The Indian government pays compensation in areas around the national park.

❖ PAYMENT FOR ENVIRONMENTAL SERVICES

Payment for Environmental Services (PES) is a concept that has recently gained popularity in the international development and conservation community. The most popular of these is financial reward for the sequestering of carbon, but it is also seen as a potential solution for human-wildlife conflict.

❖ WILDLIFE FRIENDLY PRODUCTS

Consumers is distant countries also have a role to play. Always look for products that are environmentally friendly and recognized by serious organizations.

❖ FIELD BASED SOLUTIONS

There are a number of practical field-based solutions that can limit the damage done both to humans and human property, and to wildlife, by preventing wildlife from entering the fields or villages. However, such solutions can only be applied on a case-by-case basis. What people see as solution in one place, they may resist in another. And what works in one place, may have the opposite effect somewhere else.

CASE STUDY IN TADOBA-1

- Name: Roshan Jengtha
- Age: 25 years old
- Village: Junona village
- Residence : Permanent residence
- Work: Work as a house keeper in the resort where we stayed in Tadoba
- Distance between home and forest: 1km from Junona zone
- Literacy: 1 member only (graduation, 1st year)
- Family: 4 members
- Expenditure: In house only
- Tresspassing animals: Spotted deer, Jackal, Tiger, Leopard.
- Agriculture: Rice
- Medicinal plant: Nil
- Working man in the family: 2 members
- Principle occupation: Resort workers
- Annual family income: 30,000 /-
- Number of Human wildlife conflict seen by him: Nil
- Government help: Insufficient

CASE STUDY IN TADOBA-2

- Name: Rakesh Wadai
- Age: 29 years old
- Village: Adilbashi gaon
- Residence : permanent residence
- Work: Forest guide
- Distance between home and forest: 10Km from Junona zone
- Literacy: 4 members (12^{th} pass)
- Family: 5 members
- Expenditure: in House and education
- Tresspassing animals: Spotted deer, Wild boar.
- Agriculture: Nil
- Medicinal plant: Neem, Tulsi, Haldi.
- Working man in the family: 3 members
- Principle occupation: Forest guide
- Family annual income: 30,000/-
- Number of Human wildlife conflict seen by him: 2
- Government help: Insufficient

Picture of us, taking interviews in Tadoba

CASE STUDY IN BOR -1

- Name: Dilip Jogi
- Age: 26 years old
- Village: Bordharan village
- Residence : Permanent residence
- Work: Gypsy Driver
- Distance between home and forest: 1km from Bordharan zone
- Literacy: 1 member only(12th pass)
- Family: 4 members
- Expenditure: in house only
- Tresspassing animals: Spotted deer, Sambar deer, Tiger, Nilgai, Leopard.
- Agriculture: Rice
- Medicinal plant: Neem, Tulsi, Wood-apple
- Working man in the family: 2 members
- Principle occupation: Gypsy driver, Farming
- Family annual income: 84,000/-
- Number of Human wildlife conflict seen by him: Nil
- Government help: Insufficient

CASE STUDY IN BOR -2

- Name: Manjesh Wardey
- Age: 38 years old
- Village: Bordharan village
- Residence : permanent residence
- Work: Hotel manager of one of the resorts in Bordharan
- Distance between home and forest: 1km from Bordharan zone
- Literacy: 1 member only (graduated)
- Family: 5 members
- Expenditure: in house only
- Tresspassing animals: Peacock, Sambar, Leopard
- Agriculture: Nil
- Medicinal plant: Neem, Tulsi
- Working man in the family: 1 Member only
- Principle occupation: Hotel management
- Family annual income: 90,000/-
- Number of Human wildlife conflict seen by him: 2
- Government help: Insufficient

Picture of us, taking interviews in Bor

CONCLUSION

The Gaia Hypothesis proposes that *living organisms interact with their inorganic surroundings on Earth to form a synergistic and self-regulating, complex system that helps to maintain and perpetuate the conditions for life on this planet.* (Lovelock, 1979)

Thus, the conservation of biodiversity is essential for our own survival on this planet. Biodiversity provides us with huge ecosystem services like the maintenance of the air composition and purity, formation and replenishment of soil, pollination of crops, etc.

The studying and inventorying of biodiversity of any particular area is the first step towards

❖ Identification of potential bio resources, which could be of direct use to mankind, as well as

❖ Application of conservation measures and targeting of conservation resources. Due to the limited amount of conservation resources available, it becomes necessary to target them at proper sites. Studying biodiversity helps us to identify the sites and levels where we should apply our conservation measures.

EXCURSION DISCUSSION ON THE LAST DAY OF OUR EDUCATIONAL EXCURSION TRIP AROUND A CAMP FIRE

ACKNOWLEDGEMENT

I take the opportunity to express my profound gratitude and deep regards to our professors, Prof. Swagata Chattopadhyay, Dr. Aniruddha Chatterjee and for their exemplary guidance, monitoring and constant encouragement throughout the course of this educational project. The help and guidance given by her from time to time shall carry me a long way in the long run.

I also take the opportunity to express a deep sense of gratitude to the forest officials for their care, guidance, support and help without which completing this project wouldn't have been easy.

I am also obliged to thank our principal, Dr. Arpita Mukherjee, Dr, Narayan Chandra Das for making it possible for us to go for this trip. I am thankful to the supportive staffs of the Zoology department whose assistance in the laboratory has been of immense help to this project.

Signature of the student

Gargi Mondal

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www.findia.org
www.naturalworldsafaries.com
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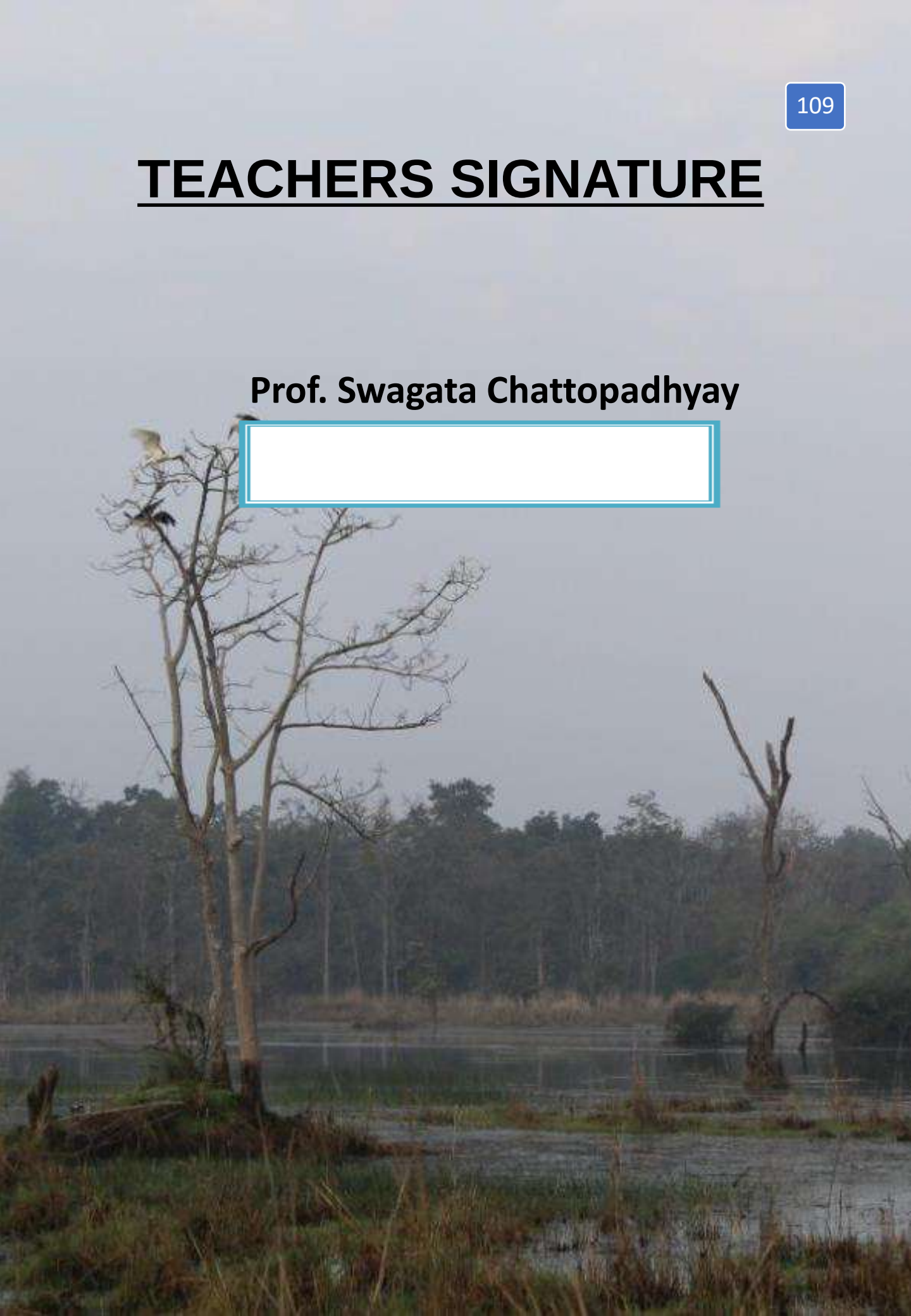
TEACHERS SIGNATURE

Prof. Swagata Chattopadhyay



UNIVERSITY OF CALCUTTA

EXCURSION TO TADOBA –ANDHARI TIGER RESERVE

SEMESTER-5 (CBCS).
NAME-MADHUMITA NASKAR
COLLEGE ROLL NO- 18S-714
SUBJECT- ZOOA.
CC- 11 .
CU ROLL NO.- 183223 -11- 0115.
CU REGN. NO.- 223 -1212- 0390 -18.

INDEX

INTRODUCTION

AIM OF EXCURSION:

The purpose of zoological excursion is to gain a much deeper knowledge about the topics related to the subject such as wildlife, nature and environment with the help of practical demonstration along with theoretical facts. While their purpose is essential to educate, they can also be a fun bonding experience for everyone involved, the knowledge of bioscience is incomplete. It also provides a scope to study wildlife and observe animals and their behaviours in their natural habitat.

Hence zoological excursion helps us to come in close contact with the flora and fauna of various places with different climatic conditions and atmospheric variations and in better understanding of the relation between flora and fauna.

PURPOSE OF EXCURSION NOTEBOOK:

Field notes refer to qualitative notes recorded by scientists or researchers or students in the course of field research, during or after their observation of a specific organism or phenomenon they are studying.

- The notes are intended to be read as evidence that gives meaning and aids in the understanding of the phenomenon.
- Field notes allow the researcher to access the subject and record what they observe in an unobtrusive manner.
- Field notes are particularly valued in descriptive sciences such as ethnography, biology, ecology, geology, and archaeology, each of which have long traditions in this area.
- Writing in such a detailed manner may contribute to the personal development of a student.

BASIC REQUIREMENTS FOR GOOD NOTES:

- **ACCURACY:** By far the most important aspect of field notes.
- **INTEGRITY:** (Complete) If the field crew fail to collect all important data, costly delays can occur in the office.
- **LEGIBILITY:** Major error can occur if notes can't be easily read.

- **ARRANGEMENT:** Following a standard note format, save time and money when trying to follow notes.
- **CLARITY:** Well planned survey with clear special notations and sketches will greatly add to the understanding of the survey.

IMPORTANCE OF EXCURSION NOTEBOOK:

An outstanding field notebook serves many potential purposes.

1. It is a valuable record of what you have seen, heard, discussed and thought about in the field.
2. It may contain the data which will lead to an oral presentation, a paper, and/or a thesis.
3. It may be graded portion of a course.
4. It may be something you and your relatives will find interesting decades in the future.

BIODIVERSITY

Biodiversity refers to the variety and variability of life on Earth. Biodiversity typically measures variation at the genetic, species, and ecosystem level. Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.

Biodiversity is not distributed evenly on Earth, and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversity is usually highest along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans.

There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

TYPES OF BIODIVERSITY:

Genetic Diversity:

- Different genes and combinations of genes within populations
- Allows population of a species to adopt to environmental changes

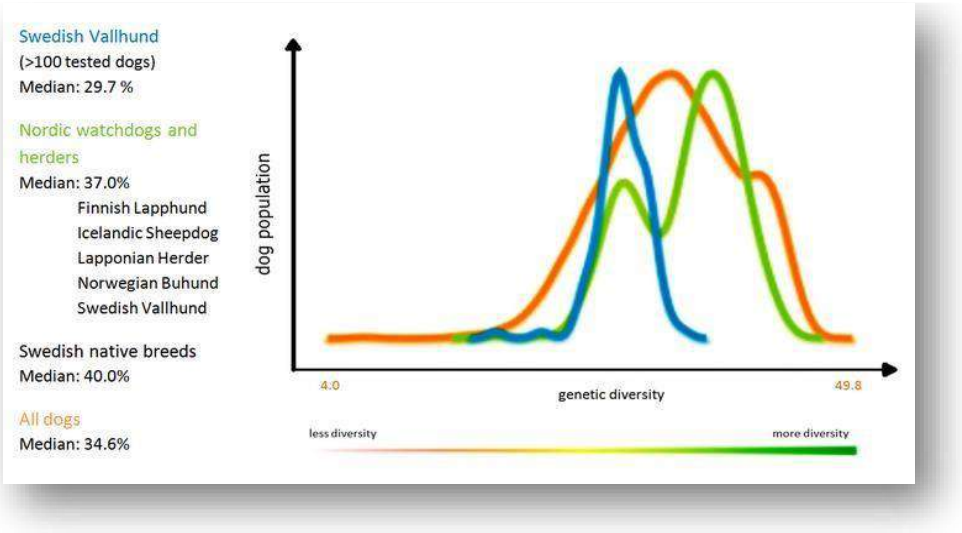


Fig: Genetic Diversity of Swedish Vallhund compared to other breeds.

Species Diversity:

- Different kinds of organism, relationships among species

- Refers to the number of kinds of species being found

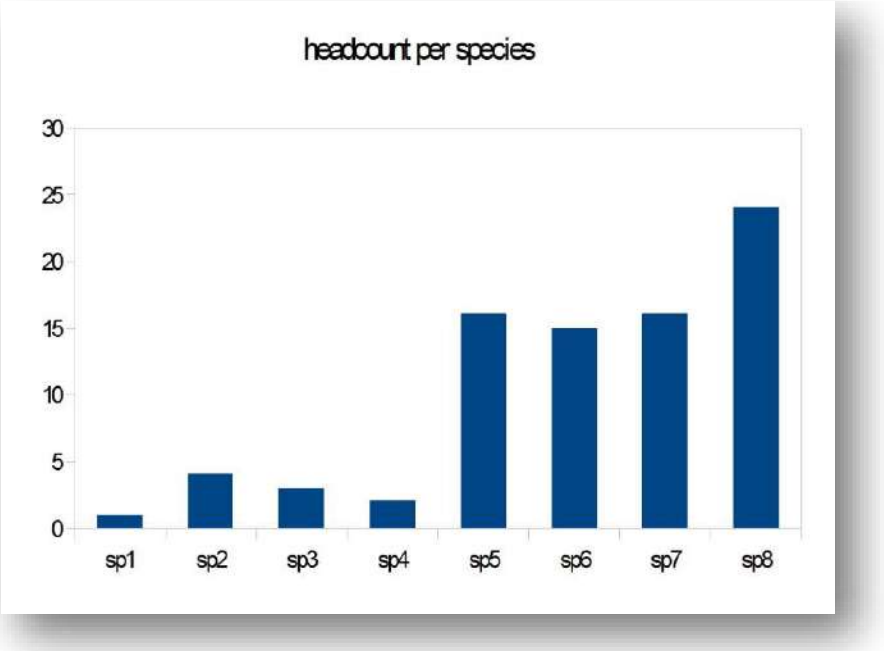


Fig: Fluctuations in species number.

Ecological Diversity:

- Different habitats, niches, species interactions
- An assemblage of species living in the same area and interacting with an environment

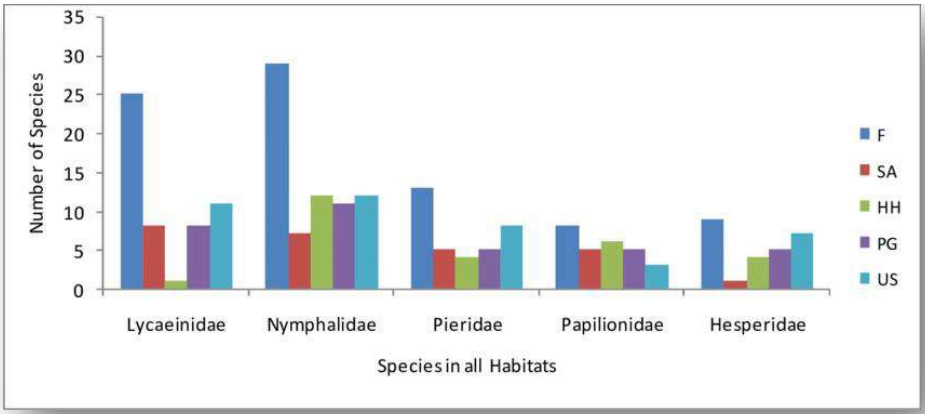


Fig: Species diversity in various Habitats.

EXCURSION DIARY:

ITIENERY:

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE :

Date of Journey :- 23rd February 2020
Train No & Name :- 12860 Gitanjali Express
Departure Time & Place :- 13:40hrs Howrah Station
Reporting Time & Place :- 12:00hrs at Howrah Station New Complex in front of Mail and Express Inquiry

DETAILS of TOUR PROGRAMME:

23/02/20:- Start from **Howrah Station** at 13:40 by 12860 Gitanjali for **Nagpur Station.**

24/02/20:- Reaching **Nagpur Station** at 07:20hrs. Start from **Nagpur Station** at 08:00hrs by Bus for **Tadoba National Park.** Reaching **Tadoba** at 12.00hrs and transfer at Forest **Rest House andDormitory**.
Afternoon and Evening : Biodiversity specimen collection studies. Night stay at **Tadoba**.

25/02/20:- Morning and Afternoon coverage **Tadoba National Park Safari (Junona and Agarjhari Zone)** by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at **Tadoba.**

26/02/20:- Start from **Tadoba** at 08.00hrs by Bus for **Bor.** Reaching **Bor** at 12.00hrs and transfer at **Forest Rest House** and **Dormitories.**
Afternoon and Evening : Biodiversity specimen collection studies.
Night stay at **Bor.**

27/02/20:- Morning and Evening coverage **Bor National Park Safari (Bordharan)** by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at **Bor at Maharastra Tourism Accomodation.**

28/02/20:- Start from **Bor** at 06.00hrs by Bus for **Nagpur Station.** Reaching **Nagpur Station** at 09.00hrs. Start from **Nagpur Station** at 10.10hrs by **12129 Azad Hind Express** for **Howrah Station.**

29/02/20:- Reaching **Howrah Station** at 04.15hrs.

ACCOMPANYING PERSONS:

- **Prof. Swagata Chattopadhyay.**
- **Sri Sunil Kr. Pramanik.**

MAP OF MADHYA PRADESH &MAHARASHTRA

FIG: MAP OF MADHYA PRADESH SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

FIG: MAP OF MAHARASHTRA SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

TADOBA ANDHARI TIGER RESERVE

FIG: MAP OF TADOBA ANDHERI TIGER RESERVE.

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

✦ Location:

Coordinates: 20◦10'N 79◦24'E

Total area covered by Tadoba National Parkis 116.55 sq.kms.

It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.

The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the Tadoba National Park, created in the year 1955.

✦ History:

Legend holds that Taru was a village chief who was killed in a mythological encounter with a tiger. A shrine dedicated to the God Taru now exists beneath a large tree, on the banks of Tadoba Lake. The temple is frequented by adivasis, especially during a fair held annually in the Hindu month of Pausha, between December and January.

The Gond kings once ruled these forests in the vicinity of the Chimur hills. Hunting was completely banned in 1935. Two decades later, in 1955, 116.54 square kilometres (45.00 sq mi) was declared a national park. Andhari Wildlife Sanctuary was created in the adjacent forests in 1986, and in 1995 both the park and the sanctuary were merged to establish the present tiger reserve.
The Andhari Wildlife Sanctuary was formed in the year 1986 and was amalgamated with the park in 1995 to establish the present Tadoba Andhari Tiger Reserve.

✦ Significance:

Tadoba National park contains some of the best of forest tracks and endowed with rich biodiversity. It is famous for its natural heritage. Tadoba is an infinite treasure trove of innumerable species of trees and plants - and wildlife that includes Tigers, Panthers, Sloth Bears, Hyenas, Jackals, Wild Dogs, Bison, Barking Deer, Nil Gai, Sambar, and Cheatal.
Known for its rich biodiversity, the Tadoba National Park is nothing less than a paradise for wildlife enthusiasts. Owing to the presence of the big cats, the park was announced as the 41st Tiger Reserve of India. Along with the tigers, the park provides a home to the Wild Boar, Leopard, Spotted Deer, Rusty Spotted Cat, Indian Mouse Deer, Sambar, Gaur, Sloth Beer, Four Horned Antelope, Flying Squirrel and so on.

✦ Etymology:

The word 'Tadoba' is derived from the name of God "Tadoba" or "Taru," which is praised by local tribal people of this region and "Andhari" is derived from the name of Andhari river that flows in this area

✦ Type of Forest:

Tadoba reserve is a predominantly southern tropical dry deciduous forest

✦ Physical Factors:

Temperature:
Winters are cold with average temperature from 9 to 25 degreecelcius.
Summers are dry and temperature is between 30 to 45 degrees celcius.

✦ Rainfall:

Tadoba experiences a humid monsoon with rainfall upto 50 inch.

✦ Topography:

Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges. Densely forested hills form Northern and Western boundary of this area. Elevation of these hills ranges from 200mts to 350mts Tadoba lake acts as the buffer between the forest and the extensive farmland which extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

✦ Geography:

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smooth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and caves provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari ranges. The south part of the park is less hilly than the remainder.

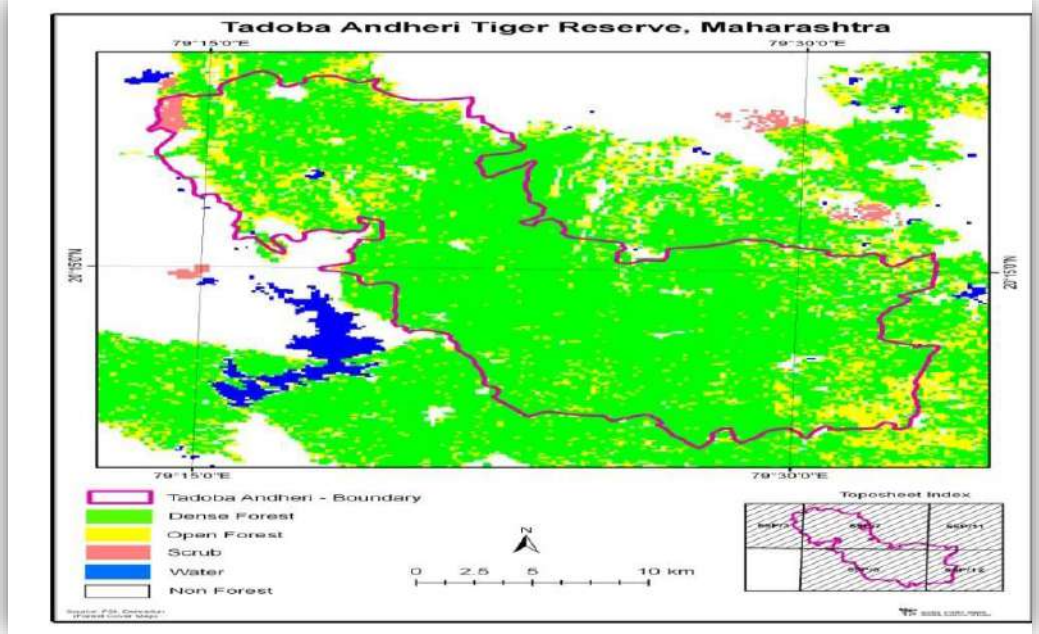


Fig:Map of Tadoba –Andhari Tiger Reserve with latitude and longitude

✦ SAFARI ZONES IN TADOBA:

The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:

Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

✦

✦ Entry Gates for Safari in Tadoba:

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai, etc. The movement of tourists inside the park is not restricted like in other reserves, therefore onecan completely enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

1. **Moharli Gate**: Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.
2. **Kuswanda:** The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.
3. **Kolara Gate:** This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.
4. **Navegaon Gate:** The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.
5. **Pangdi Gate:** The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.
6. **Zari Gate:** Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

✦ Jeep Safari in Tadoba National Park:

The Jeep Safari is the best thing that one can experience in Tadoba National Park. The open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting

a tiger and other wild animals are relatively high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more.

The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where the jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives respectively. A park guide has to accompany the jeep for security purpose. Also, the tourists can enter the park by presenting their personal information and identification papers at the gate and the foreigners by showing their passport in original.

The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

✦ Safari Timing in Tadoba:

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Moharli (Mohurli) Zone, Tadoba Zone, and Kolsa Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period	Morning		Afternoon	
	Entry	Exit	Entry	Exit
1st Oct to 30th Nov	6 AM - 8 AM	10:00 AM	2.30 PM – 4 PM	6.30 PM
1st Dec to 28th / 29th Feb	6.30 AM - 8.30 AM	11:00 AM	2 PM – 3.30 PM	6:00 PM
1st Mar to 30th April	5.30 AM – 7.30 AM	10:00 AM	3 PM – 4.30 PM	6.30 PM
1st May – 30thJune	5 AM – 7 AM	9.30 AM	3.30 PM – 5 PM	7:00 PM

✦ To Reach Tadoba National Park

By Air :

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train:

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45

Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road:

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities.

Best Time to Visit Tadoba:

March to May is the best time to see tiger as summer temperatures are extremely high especially in the month of May. The monsoon begins from June to September and Vegetation and insect life come alive with the arrival of monsoon in mid June. The post monsoon starts from October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

✦ Climate and Weather of Tadoba National Park

Winters stretch from November to February and day temperatures is between 25°-30°C and the park is looks green. Summers are too hot in Tadoba as the temperature increases to 47°C; even so it is the ideal time to sight mammals near water lakes as the vegetation is also rare, increasing visibility. The monsoon breaks in June with heavy rainfall of approx.1275 mm. and humidity is around 66%.

GROUP PHOTO AT TIGER ANDHERI RESERVE

BIODIVERSITY- THE KEY OF DIVERSITY

Biodiversity is the root of all living system. The earth is home to a rich and diverse array of living organism. The biodiversity is the natural biological capital of earth and presents opportunity to all.

India has a rich varied heritage of biodiversity, consisting of a wide spectrum of habitats. Biodiversity is indeed the bedrock of all bioindustrial development in the unusually large rural sector of our country. It is of enormous importance for human welfare.

FLORA

Bamboo(*Bambusa sp*.)

Ain(*Terminalia elliptica)*

Bija (*Pterocarpus marsupium)*

Haldu (*Haldinacordifolia)*

Salai (*Boswellia serrata)*

Semal (*Bombax ceiba*)

Shisham (*Dalbergia sissoo)*

Bel (*Aegle marmelos)*

Mahua (*Madhucalongifolia)*

Palas (*Butea monsperma)*

Hirda (*Terminalia chebula)*

Tendu (*Diospyros melanoxylon)*

Kusum (*Schleicheraoleosa)*

Dhawada (*Anogeissuslatifolia)*

Karya gum (*Sterculiaurens)*

SAFARI CENSUS

We completed a total of 2 safaris in 1 Protected Area, namely, Tadoba-Andhari Tiger Reserve.

We went on all the safaris on Gypsies.

TADOBA-ANDHARI TIGER RESERVE CENSUS:

- **Junona zone(Morning Safari) &**
- **Agarzari Zone (Afternoon Safari)**

AVIAN FAUNA

Species	*Scientific Name*	Count
1. Black Drongo	*Dicrurus macrocercus*	6
2. Parakeet	*Psittacula cyanocephala*	4
3. Black headed ibis	*Threskiornis melanocephalus*	7
4. Lesser egret	*Egretta garzetta*	14
5. Lesser whistling duck	*Dendrocygnajavanica*	17
6. Jacana	*Metopidius indicus*	3
7. White eyed buzzard	*Butastur teesa*	2
8. Indian magpie Robin	*Turdus migratorius*	2
9. Common Kingfisher	*Haleyon smyrnesis*	3
10. Blue kingfisher	*Alcedo atthis*	1
11. Peafowl and peahen	*Pavo cristatus*	14
12. Asian Open -billed stork	*Anastomous oscitans*	9
13. Green Bee eater	*Merops orientalis*	2
14. Red vented bulbul	*Pycnonotus cafer*	6
15. Indian roller	*Coracias benghalensis*	5
16. Rufous treepie	*Dendrocitta vagabunda*	4

17. Rose-ringed parrot	*Psittacula krameri*	3
18. Green junglefowl	*Gallus varius*	12
19. Great Cormorant	*Phalacrocoracidae aristotelis*	11

20. Indian Pond Heron	*Ardeola grayii*	3
21. Purple Heron	*Ardea purpurea*	3
22. Grey Heron	*Ardea cinerea*	6
23. Jungle owl	*Glaucidium radiatum*	1
24. Serpent Eagle	*Spilornis cheela*	3
25. Jungle Babbler	*Turdoides striata*	16
26. Grey headed Fish eagle	*Ichthyophaga ichthyaetus*	1
27. Cuckoo	*Cocomantis flabelliformis*	2
28. Yellow Footed Green Pigeon	*Treron phoenicoptera*	5
29. Spotted dove	*Spilopelia chinensis*	6
30. Common starling	*Sturnus vulgaris*	3
31. Grey hornbill	*Buceros bicornis*	2
32. Purple moorhen	*Porphyrio porphyrio*	15
33. Red wattled lapwing	*Vanellus indicus*	4
34. Koel	*Eudynamys scolopaceus*	3
35. Golden oriole	*Oriolus kundoo*	1
36. Black hooded oriole	*Oriolus xanthornus*	2
37. Spotted-billed duck	*Anus poecilorhyncga*	3
38. Indian Long tailed shrike	*Lanius schach*	1
39. Greater Coucal	*Centropus sinesis*	3
40. Common Tailorbird	*Orthotomus sutorius*	4
41. Woodpecker	*Picidae sp.*	1
42. Eurasian Thick -knee bird	*Burhinus oedicnemus*	2

43. Red spurfowl	*Galloperdix spadicea*	1
44. Little Grebe	*Tachybaptis ruficollis*	1
45. Glossy Ibis	*Plegadis falcinellus*	1
46. Osprey	*Pandion haliaetus*	1
47. House sparrow	*Passer domesticus*	1
48. Shikra	*Accipiter badius*	1
TOTAL OBSERVED:		**221**

Mammalian Fauna

Species	***Scientific Name***	**Count**
1.Spotted deer	*Axis axis*	28
2.Langur	*Semnopithecus entellus*	18
3.Sambar	*Rusa unicolor*	15
4.Barking deer	*Muntiacus muntjak*	2
5. Indian Gaur	*Bos gaurus*	3
6.Dhole	*Cuon alpines*	4
7.Sloth bear	*Melursus ursinus*	3
8.Jackal	*Canis aureous*	1
9.Wild boar	*Sus scrofa*	4
10. Blue bull (nilgai)	*Boselaphus tragocamelus*	2

11.Tiger	*Panthera tigris*	1
12.Tiger cubs	*Panthera tigris*	3
TOTAL OBSERVED		**84**

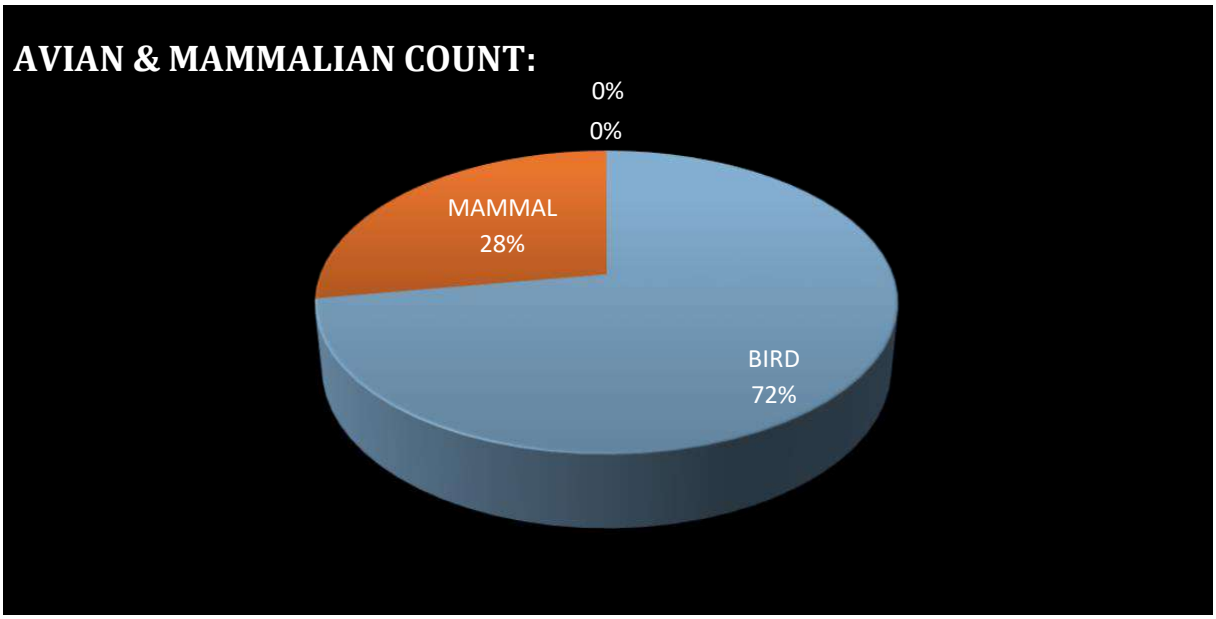


FIG: PIE-CHART OF AVIAN AND MAMMALIAN COUNTS

BIODIVERSITY INDICES

Biodiversity is one of the primary interests of ecologists, but quantifying the species diversity of ecological communities is complicated. In addition to issues of statistical sampling, the rather arbitrary nature of delineating an ecological community, and the difficulty of positively identifying all of the species present, species diversity itself has two separate components:
1.) The number of species present (*species richness*), and
2.) Their relative abundances (termed *dominance* or *evenness*).
As a result, many different measures (or indices) of biodiversity have been developed, such as

1. SHANNON INDEX

The idea behind this index is that the diversity of a community is similar to theamount of information in a code or message. It is calculated in the following way:

$$H' = -\sum\{p_i \times \ln(p_i)\}$$

Where, pi is the proportion of individuals found in species i. For a well-sampledcommunity, we can estimate this proportion as pi = ni/N, where,ni is the numberof individuals in species i and N is the total number of individuals in thecommunity.
Since by definition the pis' will all be between zero and one, thenatural log makes all of the terms of the summation negative, which is why wetake the inverse of the sum.

- ## INTERPRETATION:

Typical values are generally between 1.5 and 3.5 in mostecological studies, and the index is rarely greater than 4. The Shannon indexincreases the richness of the community increase. The fact that the index incorporates both components of biodiversity can be seen asboth a strength and a weakness. It is a strength because it provides a simple,synthetic summary, but it is a weakness because it makes it difficult to comparecommunities that differ greatly in richness.Due to the confounding of richness and evenness in the Shannon index, manybiodiversity researchers prefer to stick to two numbers for comparative studies,combining a direct estimate of species richness (the total number of species inthe community, S) with some measure of dominance or evenness. The mostcommon dominance measure is Simpson's index.

SHANNON-WEINER INDEX

The Shannon-Weiner index being a measure of uncertainty,thus measures the diversity of a particular biogeographical region.

As a part of our endeavours to study the statistical aspect and interpretations of biodiversity, the various Shannon-Weiner indices of the four forests: Tadoba,Navegaon,Nagzira and Pench were calculated.

Interpretations of the mathematical data provide an insight into the biodiversity distribution of the fauna and hence are reflected by the species richness of the forests under study.

AVIAN DIVERSITY

Name	Count	Pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190
Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042
Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098
Koyel	3	0.013	-4.299	-0.058
Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149
Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073
Bulbul	6	0.027	-3.606	-0.098

White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042
Spotted billed duck	3	0.013	-4.299	-0.058
Green bee eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufoustreepie	4	0.018	-3.452	-0.109
Rose ringed parrot	3	0.013	-4.299	-0.058
Great coucal	3	0.013	-4.299	-0.058
Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002
Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002
House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thickknee bird	2	0.009	-4.705	-0.042
Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013
Purple heron	3	0.013	-4.299	-0.058
Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109
Serpent eagle	3	0.013	-4.299	-0.058

Yellow headed fish eagle	1	0.004	-5.398	-0.002
Yellow footed green pegion	5	0.023	-3.788	-0.085
Indian long tailed shrink	1	0.004	-5.398	-0.002
TOTAL				**+1.618**

MAMMALIAN DIVERSITY

Name	**Count**	**Pi**	**ln(pi)**	**Pi*ln(pi)**
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gour	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053
TOTAL				**+2.766**

Hence, the total biodiversity index of TADOBA ANDHERI TIGER RESERVE is:-

MAMMALIAN FAUNA+ AVIAN FAUNA= 4.384.

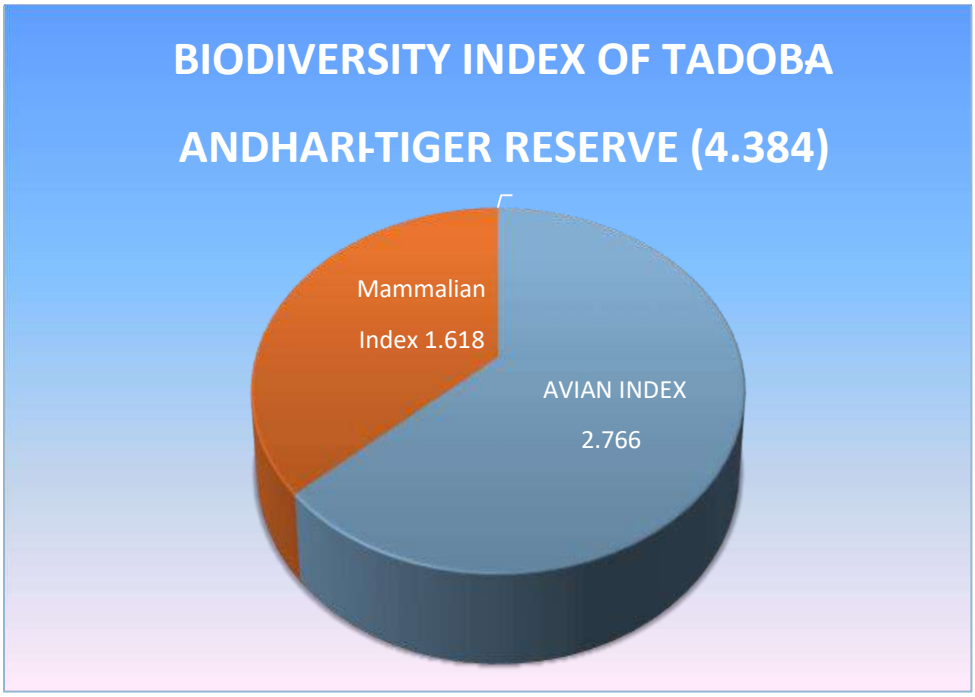


FIG: PIE CHART OF BIODIVERSITY INDEX

FAUNAL DIVERSITY

MAMMALIAN FAUNA

Melursus ursinus (Sloth bear)

Panthera tigris (Tiger)

Rusa unicolor (Sambar Deer)

Semnopithecus entellus (Langoor)

Axis axis (Spotted Deer)

Bos gaurus (Indian gaur)

AVIAN FAUNA

Threskiornis melanocephalus (Black headed Ibis)

Treron phoenicoptera(Yellow footed green pigeon)

Psittacula krameri(Rose ringed Parakeet)

Accipiter badius (Shirke)

Nest of Tailor Bird

Pavo cristatus (PeaFowl)

BUSH BEATING

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

✦ Requirements:

1. Umbrella
2. Stick/Staff
3. 70% Ethyl Alcohol
4. Air-tight Containers
5. Sterile Gloves
6. Tape

✦ Methodology

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

STUDENTS CARRYING OUT BUSH BEATING

PITFALL

Pitfall-traps: For Soil-surface-active Invertebrates.

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capture more specific types of insects.

✦ Requirements

- While carrying out Pitfall Trapping

1. Containers
2. Soap water
3. 70% Ethyl Alcohol
4. Forceps
5. Sterile Gloves
6. Sugar

✦ Methodology

For the Pitfall traps,four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.
- Soap water was poured into the containers to make the surface slippery and thereby ensuring the avoidance of escape attempts by the captured insect.

FIG: PITFALL TRAP

STUDENTS CARRYING OUT PITFALL.

STUDY OF QUADRATE

✦ Principle:-

When an ecologist wants to know how many organizations there are in a particular habitat, it would not be feasible to count them all. Instead he would be forced to count a smaller representative part of the population called sample. Sampling of plants & animals that don't move much(such as snails) can be done by using sampling square called quadrate. A suitable size of quadrate depends upon size of the organisms being sampled. For example to count plants growing on college campus one could use a quadrate with size 0.5to 1 meter in length.

✦ Materials & methods of insects collection:-

1. Small garden gloves
2. Forceps
3. A kill jar containing 70% alchol
4. Insect pins
5. Ziploc packets & plastic container
6. Labels
7. Strings
8. Wood poles
9. Magnifying glass
10. Newspaper for collection

✦ Methodology

A suitable site was selected for quadrate work to be done. An area of 1sq was measured & the region was demarcated with the help of string. The string was fixed in square form 1meter*1meter & the corners were fixed with wood poles. Thus the quadrate was formed & various species of flora & fauna were collected with the help of forceps.

STUDENTS CARRYING OUT QUADRATE STUDY

Phylum- Arthropoda **Phylum- Arthropoda**

Phylum- Arthropoda

FIG: INSECTS FOUND IN BUSH BEATING, PITFALL AND QUADRATE STUDY

Phylum- Arthropoda

Phylum- Arthropoda

Fig - insects found in Bush Beating, Pitfall, and Quadrate study

TIGER AS A KEYSTONE SPECIES

- A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether. A keystone species is often, but not always, a predator.

- Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex species can regulate species abundance, diversity, distribution; which in turn can impact the health of terrestrial habitats.

- Additionally they provide essential food sources for the grazers and remove the sick and weak from population of prey species.

- The decimation of these tiger species can have cascading effects throughout the ecosystem they inhabit, resulting in economically and ecologically devastating consequences.

- In India's Kanha National Park, the keystone species is Tiger and the jewel has been described as "barasinha".

- Tiger is the largest of the world's great cats. Barasinha, gaur, sambar, chital, nilgai help to maintain wildlife population.

PUG MARKING

Pug marking is the term used to refer to the footprint of most animals (specially mega fauna). "Pug" means foot in Hindi (Sanskrit –*Padh*; Greek –*Ped*. Every individual animal species has a different pugmark and as such it is used for identification.

IMPORTANCE OF PUGMARK:

- Wildlife conservationists are known to catalogue pugmarks in the areas they operate.
- Pugmarks are also for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries, etc.
- It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.

TO MAKE A PLASTER CAST:

MATERIALS:

- Plaster of Paris (medical quality)
- Water
- A mug to prepare paste
- A strip of thick paper or flexible aluminium.

ACKNOWLEDGEMENT

I would like to express my special thanks ofgratitude to our Principal ma'am Dr. Arpita Mukherjee& Vice principal sirDr. Supratim Das as well as our respected professors Dr. SwagataChattopadhyay, Dr. Narayan Chandra Das, Dr. SamratBhattacharya, Dr. Partha Pal, Dr. Aniruddha Chatterjee, Dr. Malini kundu and our lab assistant Sri Sunil kr Pramanikwho gave us the golden opportunityto do this wonderful field report , which also helped us in doing a lot of Research and enlightened us with a lot of knowledge about our subject and animal behavior. Secondly l would also like to thank my classmates who helped me in finalizing this report within the limited time frame. Without the help it wouldn't have been possible to complete the field report of our memorable excursion to Tadoba-andhari tiger reserve.

Date: 13.03.2021

UNIVERSITY OF CALCUTTA

EXCURSION TO TADOBA –ANDHARI TIGER RESERVE

SEMESTER – 5 (CBCS).
NAME- MYNDRILLA BANSRIAR
COLLEGE ROLL NO- 18S-704
SUBJECT- ZOOA.
CC- 11 .
CU ROLL NO.- 183223-11-0108.
CU REGN. NO.- 223-1211- 0430 -18.

INDEX

INTRODUCTION

AIM OF EXCURSION:

The purpose of zoological excursion is to gain a much deeper knowledge about the topics related to the subject such as wildlife, nature and environment with the help of practical demonstration along with theoretical facts. While their purpose is essential to educate, they can also be a fun bonding experience for everyone involved, the knowledge of bioscience is incomplete. It also provides a scope to study wildlife and observe animals and their behaviours in their natural habitat.

Hence zoological excursion helps us to come in close contact with the flora and fauna of various places with different climatic conditions and atmospheric variations and in better understanding of the relation between flora and fauna.

PURPOSE OF EXCURSION NOTEBOOK:

Field notes refer to qualitative notes recorded by scientists or researchers or students in the course of field research, during or after their observation of a specific organism or phenomenon they are studying.

- The notes are intended to be read as evidence that gives meaning and aids in the understanding of the phenomenon.
- Field notes allow the researcher to access the subject and record what they observe in an unobtrusive manner.
- Field notes are particularly valued in descriptive sciences such as ethnography, biology, ecology, geology, and archaeology, each of which have long traditions in this area.
- Writing in such a detailed manner may contribute to the personal development of a student.

BASIC REQUIREMENTS FOR GOOD NOTES:

- **ACCURACY:** By far the most important aspect of field notes.
- **INTEGRITY:** (Complete) If the field crew fail to collect all important data, costly delays can occur in the office.
- **LEGIBILITY:** Major error can occur if notes can't be easily read.

- **ARRANGEMENT:** Following a standard note format, save time and money when trying to follow notes.
- **CLARITY:** Well planned survey with clear special notations and sketches will greatly add to the understanding of the survey.

IMPORTANCE OF EXCURSION NOTEBOOK:

An outstanding field notebook serves many potential purposes.

1. It is a valuable record of what you have seen, heard, discussed and thought about in the field.
2. It may contain the data which will lead to an oral presentation, a paper, and/or a thesis.
3. It may be graded portion of a course.
4. It may be something you and your relatives will find interesting decades in the future.

BIODIVERSITY

Biodiversity refers to the variety and variability of life on Earth. Biodiversity typically measures variation at the genetic, species, and ecosystem level. Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.

Biodiversity is not distributed evenly on Earth, and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversity is usually highest along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans.

There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

TYPES OF BIODIVERSITY:

GENETIC DIVERSITY:

- Different genes and combinations of genes within populations
- Allows population of a species to adopt to environmental changes

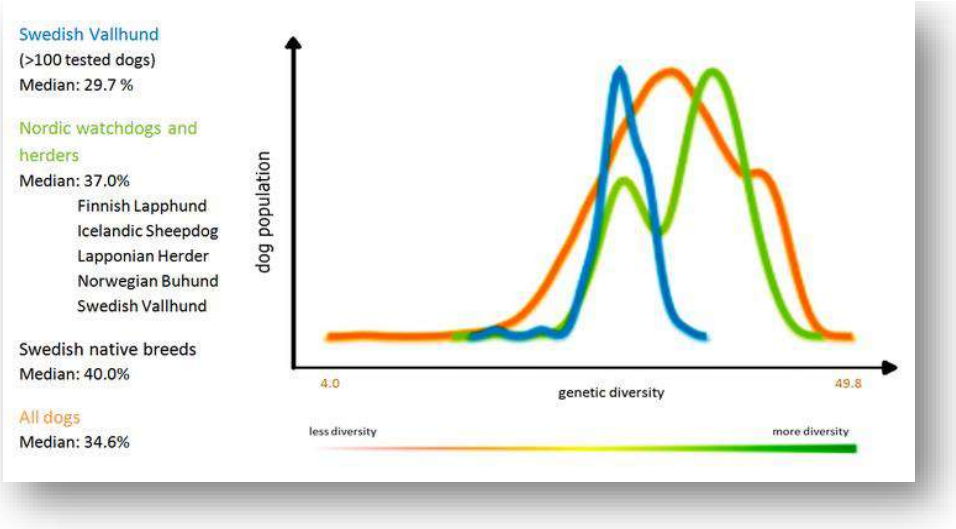


Fig: Genetic Diversity of Swedish Vallhund compared to other breeds.

SPECIES DIVERSITY:

- Different kinds of organism, relationships among species
- Refers to the number of kinds of species being found

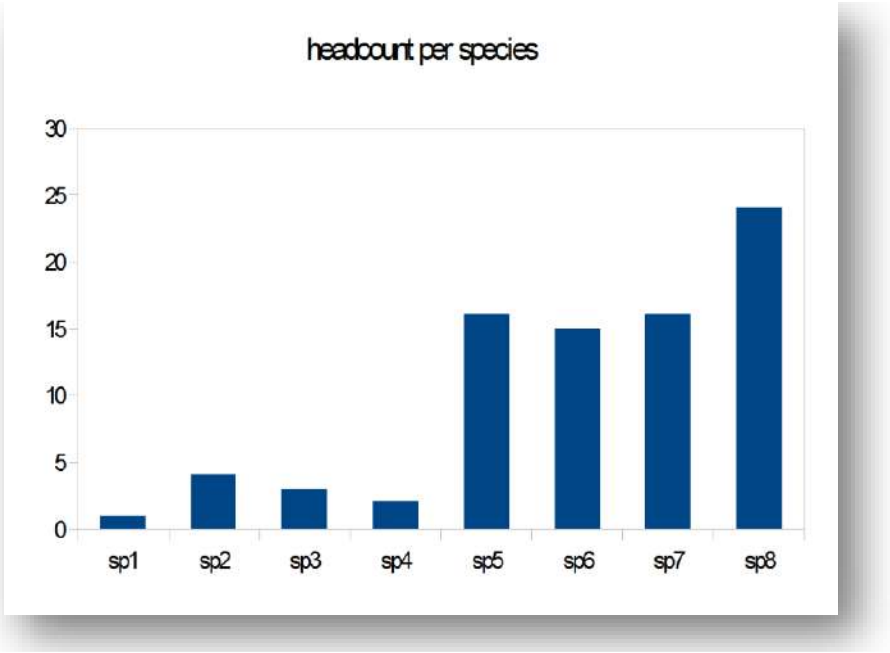


Fig: Fluctuations in species number.

ECOLOGICAL DIVERSITY:

- Different habitats, niches, species interactions
- An assemblage of species living in the same area and interacting with an environment

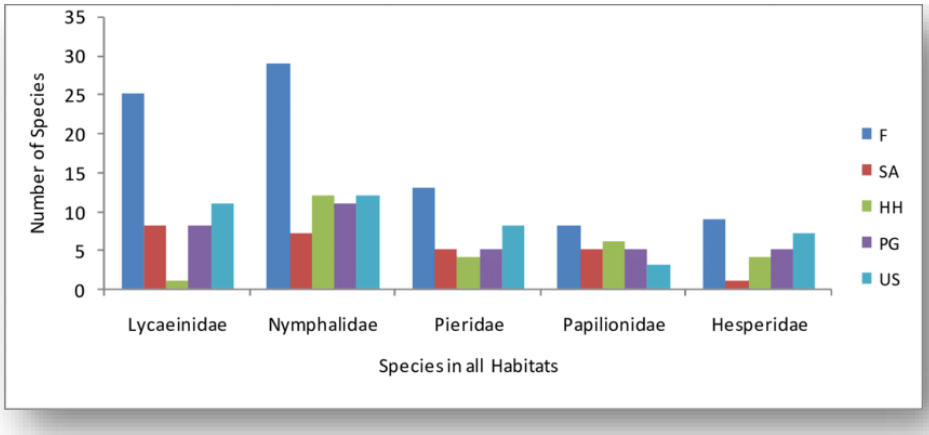


Fig: Species diversity in various Habitats.

EXCURSION DIARY:

✓ ITIENERY:

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE :

Date of Journey	:-	23rd February 2020
Train No & Name	:-	12860 Gitanjali Express
Departure Time & Place	:-	13:40hrs Howrah Station
Reporting Time & Place and Express Inquiry	:-	12:00hrs at Howrah Station New Complex in front of Mail

DETAILS OF TOUR PROGRAMME:

23/02/20:- Start from **Howrah Station** at 13:40 by 12860 Gitanjali for **Nagpur Station.**

24/02/20:- Reaching **Nagpur Station** at 07:20hrs. Start from **Nagpur Station** at 08:00hrs by Bus for **Tadoba National Park.** Reaching **Tadoba** at 12.00hrs and transfer at Forest **Rest House and Dormitory**.
Afternoon and Evening : Biodiversity specimen collection studies. Night stay at **Tadoba**.

25/02/20:- Morning and Afternoon coverage **Tadoba National Park Safari (Junona and Agarjhari Zone)** by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at **Tadoba.**

26/02/20:- Start from **Tadoba** at 08.00hrs by Bus for **Bor.** Reaching **Bor** at 12.00hrs and transfer at **Forest Rest House** and **Dormitories.**
Afternoon and Evening : Biodiversity specimen collection studies.
Night stay at **Bor.**

27/02/20:- Morning and Evening coverage **Bor National Park Safari (Bordharan)** by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at **Bor at Maharastra Tourism Accomodation.**

28/02/20:- Start from **Bor** at 06.00hrs by Bus for **Nagpur Station.** Reaching **Nagpur Station** at 09.00hrs. Start from **Nagpur Station** at 10.10hrs by **12129 Azad Hind Express** for **Howrah Station.**

29/02/20:- Reaching **Howrah Station** at 04.15hrs.

✓ ACCOMPANYING PERSONS:

- **Prof. Swagata Chattopadhyay.**
- **Sri Sunil Kr. Pramanik.**

MAP OF MADHYA PRADESH & MAHARASHTRA

FIG: MAP OF MADHYA PRADESH SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

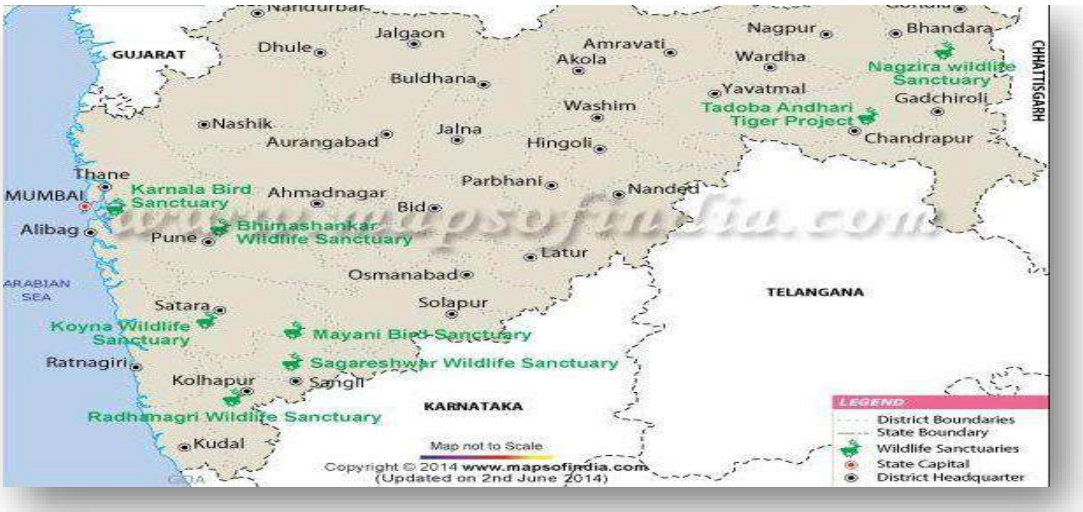


FIG: MAP OF MAHARASHTRA SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

TADOBA ANDHARI TIGER RESERVE

FIG: MAP OF TADOBA ANDHERI TIGER RESERVE.

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

LOCATION:

Coordinates: 20◦10’N 79◦24’E

Total area covered by Tadoba National Parkis 116.55 sq.kms.

It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.

The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the Tadoba National Park, created in the year 1955.

HISTORY:

Legend holds that Taru was a village chief who was killed in a mythological encounter with a tiger. A shrine dedicated to the God Taru now exists beneath a large tree, on the banks of Tadoba Lake. The temple is frequented by adivasis, especially during a fair held annually in the Hindu month of Pausha, between December and January.

The Gond kings once ruled these forests in the vicinity of the Chimur hills. Hunting was completely banned in 1935. Two decades later, in 1955, 116.54 square kilometres (45.00 sq mi) was declared a national park. Andhari Wildlife Sanctuary was created in the adjacent forests in 1986, and in 1995 both the park and the sanctuary were merged to establish the present tiger reserve.
The Andhari Wildlife Sanctuary was formed in the year 1986 and was amalgamated with the park in 1995 to establish the present Tadoba Andhari Tiger Reserve.

- ## SIGNIFICANCE:

Tadoba National park contains some of the best of forest tracks and endowed with rich biodiversity. It is famous for its natural heritage. Tadoba is an infinite treasure trove of innumerable species of trees and plants - and wildlife that includes Tigers, Panthers, Sloth Bears, Hyenas, Jackals, Wild Dogs, Bison, Barking Deer, Nil Gai, Sambar, and Cheatal.
Known for its rich biodiversity, the Tadoba National Park is nothing less than a paradise for wildlife enthusiasts. Owing to the presence of the big cats, the park was announced as the 41st Tiger Reserve of India. Along with the tigers, the park provides a home to the Wild Boar, Leopard, Spotted Deer, Rusty Spotted Cat, Indian Mouse Deer, Sambar, Gaur, Sloth Beer, Four Horned Antelope, Flying Squirrel and so on.

- ## ETYMOLOGY:

The word 'Tadoba' is derived from the name of God "Tadoba" or "Taru," which is praised by local tribal people of this region and "Andhari" is derived from the name of Andhari river that flows in this area

- ## TYPE OF FOREST:

Tadoba reserve is a predominantly southern tropical dry deciduous forest

- ## PHYSICAL FACTORS:

Temperature:
Winters are cold with average temperature from 9 to 25 degreecelcius.
Summers are dry and temperature is between 30 to 45 degrees celcius.

RAINFALL:

Tadoba experiences a humid monsoon with rainfall upto 50 inch.

TOPOGRAPHY:

Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges. Densely forested hills form Northern and Western boundary of this area. Elevation of these hills ranges from 200mts to 350mts Tadoba lake acts as the buffer between the forest and the extensive farmland which extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

GEOGRAPHY:

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smooth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and caves provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari ranges. The south part of the park is less hilly than the remainder.

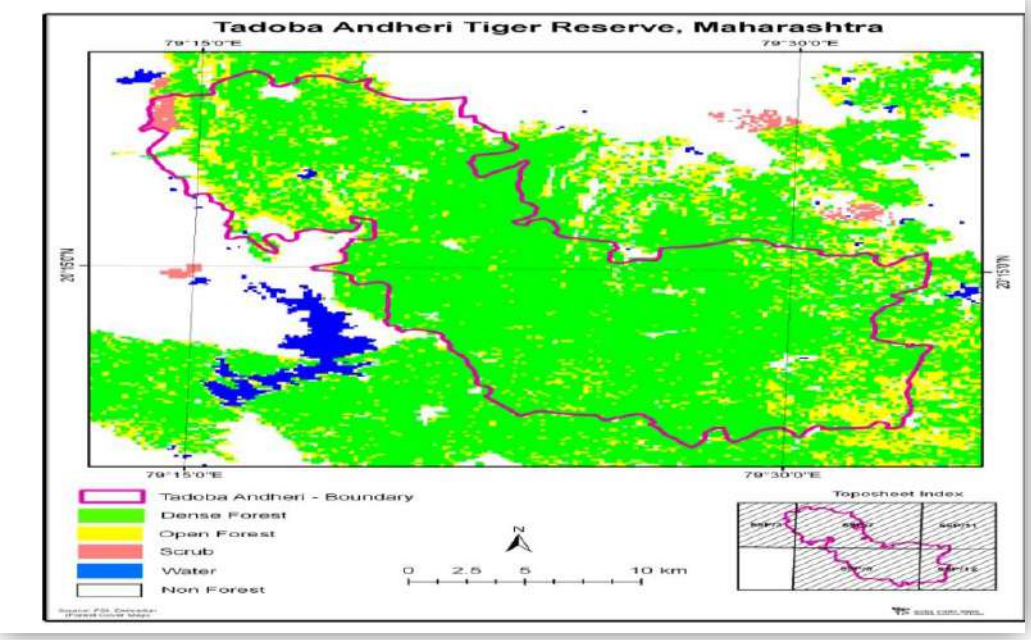


Fig: Map of Tadoba –Andhari Tiger Reserve with latitude and longitude

SAFARI ZONES IN TADOBA:

The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:

Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

ENTRY GATES FOR SAFARI IN TADOBA:

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai,

etc. The movement of tourists inside the park is not restricted like in other reserves, therefore one can completely enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

1. **Moharli Gate**: Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.
2. **Kuswanda:** The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.
3. **Kolara Gate:** This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.
4. **Navegaon Gate:** The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.
5. **Pangdi Gate:** The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.
6. **Zari Gate:** Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

▪ JEEP SAFARI IN TADOBA NATIONAL PARK:

The Jeep Safari is the best thing that one can experience in Tadoba National Park. The open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting a tiger and other wild animals are relatively high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more.

The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where the jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be

paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives respectively. A park guide has to accompany the jeep for security purpose. Also, the tourists can enter the park by presenting their personal information and identification papers at the gate and the foreigners by showing their passport in original.
The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

- ## SAFARI TIMING IN TADOBA:

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Moharli (Mohurli) Zone, Tadoba Zone, and Kolsa Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period	Morning		Afternoon	
	Entry	Exit	Entry	Exit
1st Oct to 30th Nov	6 AM - 8 AM	10:00 AM	2.30 PM – 4 PM	6.30 PM
1st Dec to 28th / 29th Feb	6.30 AM - 8.30 AM	11:00 AM	2 PM – 3.30 PM	6:00 PM
1st Mar to 30th April	5.30 AM – 7.30 AM	10:00 AM	3 PM – 4.30 PM	6.30 PM
1st May – 30thJune	5 AM – 7 AM	9.30 AM	3.30 PM – 5 PM	7:00 PM

- ## TO REACH TADOBA NATIONAL PARK

By Air :

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train:

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road:

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities.

Best Time to Visit Tadoba:

March to May is the best time to see tiger as summer temperatures are extremely high especially in the month of May. The monsoon begins from June to September and Vegetation and insect life come alive with the arrival of monsoon in mid June. The post monsoon starts from October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

- ## Climate and Weather of Tadoba National Park

Winters stretch from November to February and day temperatures is between 25°-30°C and the park is looks green. Summers are too hot in Tadoba as the temperature increases to 47°C; even so it is the ideal time to sight mammals near water lakes as the vegetation is also rare, increasing visibility. The monsoon breaks in June with heavy rainfall of approx.1275 mm. and humidity is around 66%.

GROUP PHOTO AT TIGER ANDHERI RESERVE

BIODIVERSITY- THE KEY OF DIVERSITY

Biodiversity is the root of all living system. The earth is home to a rich and diverse array of living organism. The biodiversity is the natural biological capital of earth and presents opportunity to all.

India has a rich varied heritage of biodiversity, consisting of a wide spectrum of habitats. Biodiversity is indeed the bedrock of all bioindustrial development in the unusually large rural sector of our country. It is of enormous importance for human welfare.

FLORA

Bamboo (*Bambusa sp*.)

Ain (*Terminalia elliptica)*

Bija (*Pterocarpus marsupium)*

Haldu (*Haldinacordifolia)*

Salai (*Boswellia serrata)*

Semal (*Bombax ceiba*)

Shisham (*Dalbergia sissoo)*

Bel (*Aegle marmelos)*

Mahua (*Madhucalongifolia)*

Palas (*Butea monsperma)*

Hirda (*Terminalia chebula)*

Tendu (*Diospyros melanoxylon)*

Kusum (*Schleicheraoleosa)*

Dhawada (*Anogeissuslatifolia)*

Karya gum (*Sterculiaurens)*

SAFARI CENSUS

We completed a total of 2 safaris in 1 Protected Area, namely, Tadoba-Andhari Tiger Reserve.

We went on all the safaris on Gypsies.

✓ TADOBA-ANDHARI TIGER RESERVE CENSUS:

- **Junona zone(Morning Safari) &**
- **Agarzari Zone (Afternoon Safari)**

AVIAN FAUNA

Species	*Scientific Name*	Count
1. Black Drongo	*Dicrurus macrocercus*	6
2. Parakeet	*Psittacula cyanocephala*	4
3. Black headed ibis	*Threskiornis melanocephalus*	7
4. Lesser egret	*Egretta garzetta*	14
5. Lesser whistling duck	*Dendrocygnajavanica*	17
6. Jacana	*Metopidius indicus*	3
7. White eyed buzzard	*Butastur teesa*	2
8. Indian magpie Robin	*Turdus migratorius*	2
9. Common Kingfisher	*Haleyon smyrnesis*	3
10. Blue kingfisher	*Alcedo atthis*	1
11. Peafowl and peahen	*Pavo cristatus*	14
12. Asian Open -billed stork	*Anastomous oscitans*	9
13. Green Bee eater	*Merops orientalis*	2
14. Red vented bulbul	*Pycnonotus cafer*	6
15. Indian roller	*Coracias benghalensis*	5
16. Rufous treepie	*Dendrocitta vagabunda*	4
17. Rose-ringed parrot	*Psittacula krameri*	3
18. Green junglefowl	*Gallus varius*	12
19. Great Cormorant	*Phalacrocoracidae aristotelis*	11

20. Indian Pond Heron	*Ardeola grayii*	3
21. Purple Heron	*Ardea purpurea*	3
22. Grey Heron	*Ardea cinerea*	6
23. Jungle owl	*Glaucidium radiatum*	1
24. Serpent Eagle	*Spilornis cheela*	3
25. Jungle Babbler	*Turdoides striata*	16
26. Grey headed Fish eagle	*Ichthyophaga ichthyaetus*	1
27. Cuckoo	*Cocomantis flabelliformis*	2
28. Yellow Footed Green Pigeon	*Treron phoenicoptera*	5
29. Spotted dove	*Spilopelia chinensis*	6
30. Common starling	*Sturnus vulgaris*	3
31. Grey hornbill	*Buceros bicornis*	2
32. Purple moorhen	*Porphyrio porphyrio*	15
33. Red wattled lapwing	*Vanellus indicus*	4
34. Koel	*Eudynamys scolopaceus*	3
35. Golden oriole	*Oriolus kundoo*	1
36. Black hooded oriole	*Oriolus xanthornus*	2
37. Spotted-billed duck	*Anus poecilorhyncga*	3
38. Indian Long tailed shrike	*Lanius schach*	1
39. Greater Coucal	*Centropus sinesis*	3
40. Common Tailorbird	*Orthotomus sutorius*	4
41. Woodpecker	*Picidae sp.*	1
42. Eurasian Thick -knee bird	*Burhinus oedicnemus*	2
43. Red spurfowl	*Galloperdix spadicea*	1
44. Little Grebe	*Tachybaptis ruficollis*	1
45. Glossy Ibis	*Plegadis falcinellus*	1
46. Osprey	*Pandion haliaetus*	1
47. House sparrow	*Passer domesticus*	1
48. Shikra	*Accipiter badius*	1
TOTAL OBSERVED:		**221**

MAMMALIAN FAUNA

Species	***Scientific Name***	**Count**
1.Spotted deer	*Axis axis*	28
2.Langur	*Semnopithecus entellus*	18
3.Sambar	*Rusa unicolor*	15
4.Barking deer	*Muntiacus muntjak*	2
5. Indian Gaur	*Bos gaurus*	3
6.Dhole	*Cuon alpines*	4
7.Sloth bear	*Melursus ursinus*	3
8.Jackal	*Canis aureous*	1
9.Wild boar	*Sus scrofa*	4
10. Blue bull (nilgai)	*Boselaphus tragocamelus*	2
11.Tiger	*Panthera tigris*	1
12.Tiger cubs	*Panthera tigris*	3
TOTAL OBSERVED		**84**

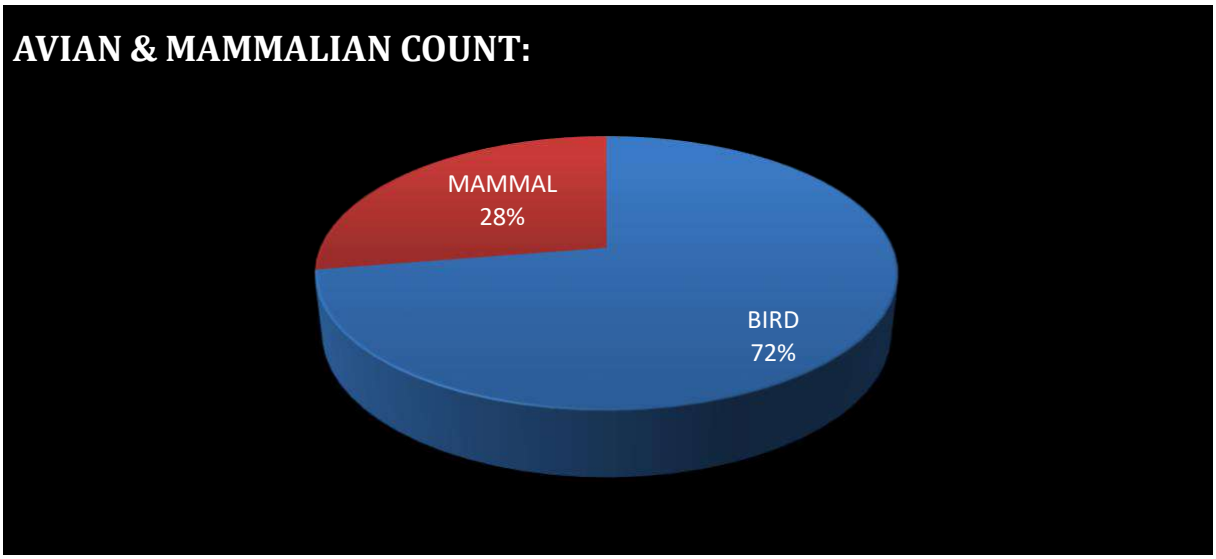


FIG: PIE-CHART OF AVIAN AND MAMMALIAN COUNTS

BIODIVERSITY INDICES

Biodiversity is one of the primary interests of ecologists, but quantifying the species diversity of ecological communities is complicated. In addition to issues of statistical sampling, the rather arbitrary nature of delineating an ecological community, and the difficulty of positively identifying all of the species present, species diversity itself has two separate components:
1.) The number of species present (*species richness*), and
2.) Their relative abundances (termed *dominance* or *evenness*).
As a result, many different measures (or indices) of biodiversity have been developed, such as

1. SHANNON INDEX

The idea behind this index is that the diversity of a community is similar to the amount of information in a code or message. It is calculated in the following way:

$$H' = -\sum\{p_i \times \ln(p_i)\}$$

Where, pi is the proportion of individuals found in species i. For a well-sampled community, we can estimate this proportion as
pi = ni/N,
where, ni is the number of individuals in species i and N is the total number of individuals in the community.
Since by definition the pis' will all be between zero and one, the natural log makes all of the terms of the summation negative, which is why we take the inverse of the sum.

- ## INTERPRETATION:

Typical values are generally between 1.5 and 3.5 in most ecological studies, and the index is rarely greater than 4. The Shannon index increases the richness of the community increase. The fact that the index incorporates both components of biodiversity can be seen as both a strength and a weakness. It is a strength because it provides a simple, synthetic summary, but it is a weakness because it makes it difficult to compare communities that differ greatly in richness. Due to the confounding of richness and evenness in the Shannon index, many biodiversity researchers prefer to stick to two numbers for comparative studies, combining a direct estimate of species richness (the total number of species in the community, S) with some measure of dominance or evenness. The most common dominance measure is Simpson's index.

SHANNON-WEINER INDEX

The Shannon-Weiner index being a measure of uncertainty, thus measures the diversity of a particular bio geographical region.

As a part of our endeavours to study the statistical aspect and interpretations of biodiversity, the various Shannon-Weiner indices of the four forests: Tadoba, Navegaon, Nagzira and Pench were calculated.

Interpretations of the mathematical data provide an insight into the biodiversity distribution of the fauna and hence are reflected by the species richness of the forests under study.

AVIAN DIVERSITY

Name	Count	Pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190
Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042
Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098
Koyel	3	0.013	-4.299	-0.058
Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149
Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073
Bulbul	6	0.027	-3.606	-0.098
White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042

Spotted billed duck	3	0.013	-4.299	-0.058
Green bee eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufoustreepie	4	0.018	-3.452	-0.109
Rose ringed parrot	3	0.013	-4.299	-0.058
Great coucal	3	0.013	-4.299	-0.058
Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002
Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002
House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thickknee bird	2	0.009	-4.705	-0.042
Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013
Purple heron	3	0.013	-4.299	-0.058
Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109
Serpent eagle	3	0.013	-4.299	-0.058
Yellow headed fish eagle	1	0.004	-5.398	-0.002
Yellow footed green pegion	5	0.023	-3.788	-0.085
Indian long tailed shrink	1	0.004	-5.398	-0.002
TOTAL				**+1.618**

MAMMALIAN DIVERSITY

Name	Count	Pi	ln(pi)	Pi*ln(pi)
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gour	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053
TOTAL				**+2.766**

Hence, the total biodiversity index of TADOBA ANDHERI TIGER RESERVE is:-

MAMMALIAN FAUNA+ AVIAN FAUNA= 4.384.

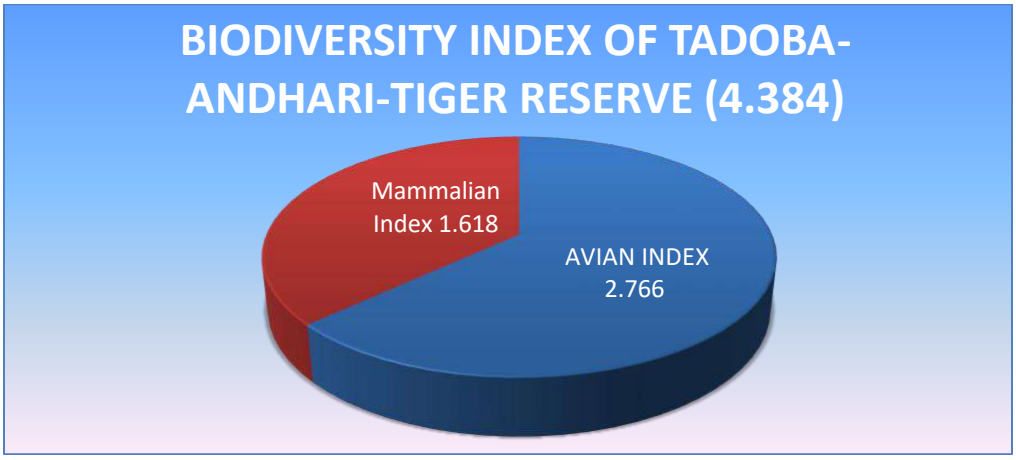


FIG: PIE CHART OF BIODIVERSITY INDEX

FAUNAL DIVERSITY

MAMMALIAN FAUNA

Melursus ursinus (Sloth bear)

Panthera tigris (Tiger)

Rusa unicolor (Sambar Deer)

Semnopithecus entellus (Langoor)

Axis axis (Spotted Deer)

Bos gaurus (Indian gaur)

AVIAN FAUNA

Threskiornis melanocephalus (Black headed Ibis)

Treron phoenicoptera (Yellow footed green pigeon)

Psittacula krameri (Rose ringed Parakeet)

Accipiter badius (Shirke)

Nest of Tailor Bird

Pavo cristatus (PeaFowl)

BUSH BEATING

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

REQUIREMENTS:

1. Umbrella
2. Stick/Staff
3. 70% Ethyl Alcohol
4. Air-tight Containers
5. Sterile Gloves
6. Tape

METHODOLOGY

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

STUDENTS CARRYING OUT BUSH BEATING

PITFALL

Pitfall-traps: For Soil-surface-active Invertebrates.

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capture more specific types of insects.

REQUIREMENTS

- While carrying out Pitfall Trapping

1. Containers
2. Soap water
3. 70% Ethyl Alcohol
4. Forceps
5. Sterile Gloves
6. Sugar

METHODOLOGY

For the Pitfall traps, four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.
- Soap water was poured into the containers to make the surface slippery and thereby ensuring the avoidance of escape attempts by the captured insect.

FIG: PITFALL TRAP

STUDENTS CARRYING OUT PITFALL.

STUDY OF QUADRATE

PRINCIPLE:-

When an ecologist wants to know how many organizations there are in a particular habitat, it would not be feasible to count them all. Instead he would be forced to count a smaller representative part of the population called sample. Sampling of plants & animals that don't move much (such as snails) can be done by using sampling square called quadrate. A suitable size of quadrate depends upon size of the organisms being sampled. For example to count plants growing on college campus one could use a quadrate with size 0.5 to 1 meter in length.

MATERIALS & METHODS OF INSECTS COLLECTION:-

1. Small garden gloves
2. Forceps
3. A kill jar containing 70% alchol
4. Insect pins
5. Ziploc packets & plastic container
6. Labels
7. Strings
8. Wood poles
9. Magnifying glass
10. Newspaper for collection

METHODOLOGY

A suitable site was selected for quadrate work to be done. An area of 1sq was measured & the region was demarcated with the help of string. The string was fixed in square form 1meter*1meter & the corners were fixed with wood poles. Thus the quadrate was formed & various species of flora & fauna were collected with the help of forceps.

STUDENTS CARRYING OUT QUADRATE STUDY

FIG: INSECTS FOUND IN BUSH BEATING, PITFALL AND QUADRATE STUDY

TIGER AS A KEYSTONE SPECIES

- A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether. A keystone species is often, but not always, a predator.

- Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex species can regulate species abundance, diversity, distribution; which in turn can impact the health of terrestrial habitats.

- Additionally they provide essential food sources for the grazers and remove the sick and weak from population of prey species.

- The decimation of these tiger species can have cascading effects throughout the ecosystem they inhabit, resulting in economically and ecologically devastating consequences.

- In India's Kanha National Park, the keystone species is Tiger and the jewel has been described as "barasinha".

- Tiger is the largest of the world's great cats. Barasinha, gaur, sambar, chital, nilgai help to maintain wildlife population.

PUG MARKING

Pug marking is the term used to refer to the footprint of most animals (specially mega fauna). "Pug" means foot in Hindi (Sanskrit –*Padh*; Greek –*Ped*. Every individual animal species has a different pugmark and as such it is used for identification.

IMPORTANCE OF PUGMARK:

- Wildlife conservationists are known to catalogue pugmarks in the areas they operate.
- Pugmarks are also for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries, etc.
- It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.

TO MAKE A PLASTER CAST:

MATERIALS:

- Plaster of Paris (medical quality)
- Water
- A mug to prepare paste
- A strip of thick paper or flexible aluminium.

ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to our Principal ma'am Dr. Arpita Mukerji & Vice principal sir Dr. Supratim Das as well as our respected professors Dr. Swagata Chattopadhyay, Dr. Narayan Chandra Das, Dr. Samrat Bhattacharya, Dr. Partha Pal, Dr. Aniruddha Chatterjee, Dr. Malini kundu and our lab assistant Sri Sunil kr Pramanik who gave us the golden opportunity to do this wonderful field report , which also helped us in doing a lot of Research and enlightened us with a lot of knowledge about our subject and animal behavior. Secondly l would also like to thank my classmates who helped me in finalizing this report within the limited time frame. Without the help it wouldn't have been possible to complete the field report of our memorable excursion to Tadoba-andhari tiger reserve.

MYNDRILLA BANSRIAR
CU Roll no- 183223-11-0108
CU Reg no- 223-1211-0430-18
Scottish Church College
Date: 13.03.2021

UNIVERSITY OF CALCUTTA

EXCURSION TO TADOBA –ANDHARI TIGER RESERVE

SEMESTER – 5 (CBCS).
SUBJECT– ZOOA.
CC– 11 .
CU ROLL NO.– 183223–.21–0173
CU REGN. NO.– 223–1111– 0595 –18.
PRATYUSH NATH
ROLL NO. – 18S–722

INDEX

INTRODUCTION

AIM OF EXCURSION:

The purpose of zoological excursion is to gain a much deeper knowledge about the topics related to the subject such as wildlife, nature and environment with the help of practical demonstration along with theoretical facts. While their purpose is essential to educate, they can also be a fun bonding experience for everyone involved, the knowledge of bioscience is incomplete. It also provides a scope to study wildlife and observe animals and their behaviours in their natural habitat.

Hence zoological excursion helps us to come in close contact with the flora and fauna of various places with different climatic conditions and atmospheric variations and in better understanding of the relation between flora and fauna.

PURPOSE OF EXCURSION NOTEBOOK:

Field notes refer to qualitative notes recorded by scientists or researchers or students in the course of field research, during or after their observation of a specific organism or phenomenon they are studying.

- The notes are intended to be read as evidence that gives meaning and aids in the understanding of the phenomenon.
- Field notes allow the researcher to access the subject and record what they observe in an unobtrusive manner.
- Field notes are particularly valued in descriptive sciences such as ethnography, biology, ecology, geology, and archaeology, each of which have long traditions in this area.
- Writing in such a detailed manner may contribute to the personal development of a student.

BASIC REQUIREMENTS FOR GOOD NOTES:

- **ACCURACY:** By far the most important aspect of field notes.
- **INTEGRITY:** (Complete) If the field crew fail to collect all important data, costly delays can occur in the office.
- **LEGIBILITY:** Major error can occur if notes can't be easily read.
- **ARRANGEMENT:** Following a standard note format, save time and money when trying to follow notes.
- **CLARITY:** Well planned survey with clear special notations and sketches will greatly add to the understanding of the survey.

IMPORTANCE OF EXCURSION NOTEBOOK:

An outstanding field notebook serves many potential purposes.

1. It is a valuable record of what you have seen, heard, discussed and thought about in the field.
2. It may contain the data which will lead to an oral presentation, a paper, and/or a thesis.
3. It may be graded portion of a course.
4. It may be something you and your relatives will find interesting decades in the future.

BIODIVERSITY

Biodiversity refers to the variety and variability of life on Earth. Biodiversity typically measures variation at the genetic, species, and ecosystem level. Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.

Biodiversity is not distributed evenly on Earth, and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversity is usually highest along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans.

There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

TYPES OF BIODIVERSITY:

GENETIC DIVERSITY:

- Different genes and combinations of genes within populations
- Allows population of a species to adopt to environmental changes

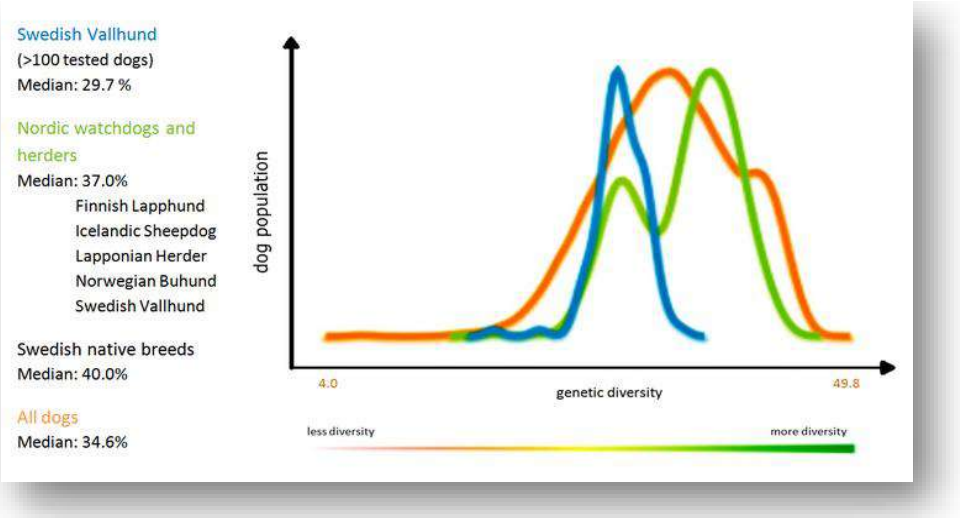


Fig: Genetic Diversity of Swedish Vallhund compared to other breeds.

SPECIES DIVERSITY:

- Different kinds of organism, relationships among species
- Refers to the number of kinds of species being found

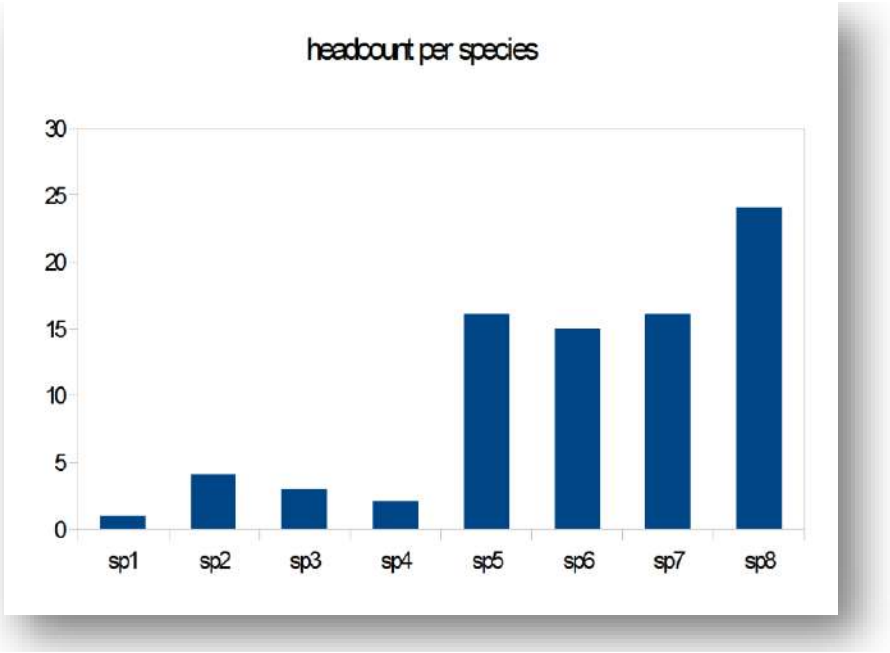


Fig: Fluctuations in species number.

ECOLOGICAL DIVERSITY:

- Different habitats, niches, species interactions
- An assemblage of species living in the same area and interacting with an environment

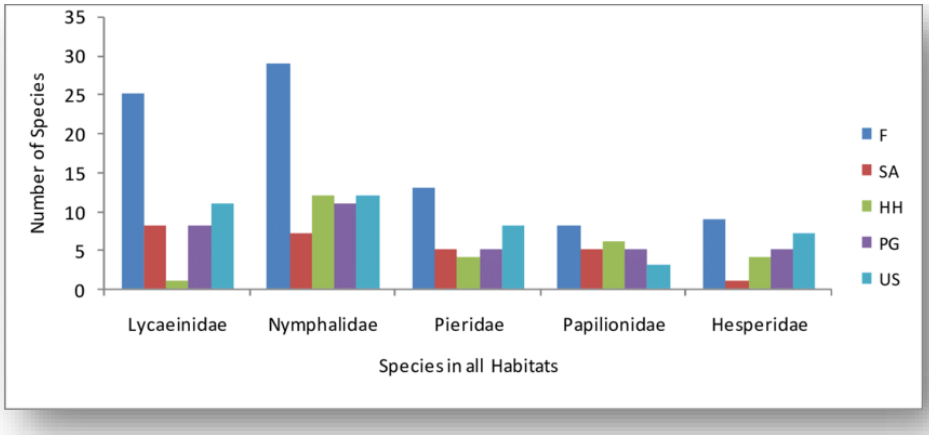


Fig: Species diversity in various Habitats.

EXCURSION DIARY:

✓ ITIENERY:

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE :

Date of Journey	:-	23rd February 2020
Train No & Name	:-	12860 Gitanjali Express
Departure Time & Place	:-	13:40hrs Howrah Station
Reporting Time & Place and Express Inquiry	:-	12:00hrs at Howrah Station New Complex in front of Mail

DETAILS OF TOUR PROGRAMME:

23/02/20:- Start from **Howrah Station** at 13:40 by 12860 Gitanjali for **Nagpur Station.**

24/02/20:- Reaching **Nagpur Station** at 07:20hrs. Start from **Nagpur Station** at 08:00hrs by Bus for **Tadoba National Park.** Reaching **Tadoba** at 12.00hrs and transfer at Forest **Rest House and Dormitory**.
Afternoon and Evening : Biodiversity specimen collection studies. Night stay at **Tadoba**.

25/02/20:- Morning and Afternoon coverage **Tadoba National Park Safari (Junona and Agarjhari Zone)** by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at **Tadoba.**

26/02/20:- Start from **Tadoba** at 08.00hrs by Bus for **Bor.** Reaching **Bor** at 12.00hrs and transfer at **Forest Rest House** and **Dormitories.**
Afternoon and Evening : Biodiversity specimen collection studies.
Night stay at **Bor.**

27/02/20:- Morning and Evening coverage **Bor National Park Safari (Bordharan)** by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at **Bor at Maharastra Tourism Accomodation.**

28/02/20:- Start from **Bor** at 06.00hrs by Bus for **Nagpur Station.** Reaching **Nagpur Station** at 09.00hrs. Start from **Nagpur Station** at 10.10hrs by **12129 Azad Hind Express** for **Howrah Station.**

29/02/20:- Reaching **Howrah Station** at 04.15hrs.

✓ ACCOMPANYING PERSONS:

- **Prof. Swagata Chattopadhyay.**
- **Sri Sunil Kr. Pramanik.**

MAP OF MADHYA PRADESH & MAHARASHTRA

FIG: MAP OF MADHYA PRADESH SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

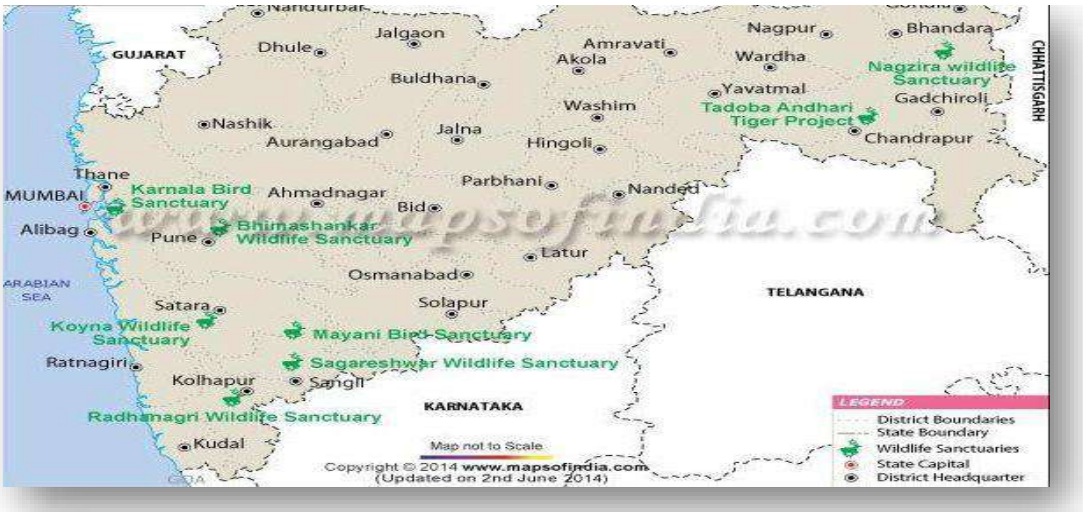


FIG: MAP OF MAHARASHTRA SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

TADOBA ANDHARI TIGER RESERVE

FIG: MAP OF TADOBA ANDHERI TIGER RESERVE.

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

LOCATION:

Coordinates: 20◦10’N 79◦24’E

Total area covered by Tadoba National Parkis 116.55 sq.kms.

It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.

The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the Tadoba National Park, created in the year 1955.

HISTORY:

Legend holds that Taru was a village chief who was killed in a mythological encounter with a tiger. A shrine dedicated to the God Taru now exists beneath a large tree, on the banks of Tadoba Lake. The temple is frequented by adivasis, especially during a fair held annually in the Hindu month of Pausha, between December and January.

The Gond kings once ruled these forests in the vicinity of the Chimur hills. Hunting was completely banned in 1935. Two decades later, in 1955, 116.54 square kilometres (45.00 sq mi) was declared a national park. Andhari Wildlife Sanctuary was created in the adjacent forests in 1986, and in 1995 both the park and the sanctuary were merged to establish the present tiger reserve.
The Andhari Wildlife Sanctuary was formed in the year 1986 and was amalgamated with the park in 1995 to establish the present Tadoba Andhari Tiger Reserve.

- ## SIGNIFICANCE:

Tadoba National park contains some of the best of forest tracks and endowed with rich biodiversity. It is famous for its natural heritage. Tadoba is an infinite treasure trove of innumerable species of trees and plants - and wildlife that includes Tigers, Panthers, Sloth Bears, Hyenas, Jackals, Wild Dogs, Bison, Barking Deer, Nil Gai, Sambar, and Cheatal.
Known for its rich biodiversity, the Tadoba National Park is nothing less than a paradise for wildlife enthusiasts. Owing to the presence of the big cats, the park was announced as the 41st Tiger Reserve of India. Along with the tigers, the park provides a home to the Wild Boar, Leopard, Spotted Deer, Rusty Spotted Cat, Indian Mouse Deer, Sambar, Gaur, Sloth Beer, Four Horned Antelope, Flying Squirrel and so on.

- ## ETYMOLOGY:

The word 'Tadoba' is derived from the name of God "Tadoba" or "Taru," which is praised by local tribal people of this region and "Andhari" is derived from the name of Andhari river that flows in this area

- ## TYPE OF FOREST:

Tadoba reserve is a predominantly southern tropical dry deciduous forest

- ## PHYSICAL FACTORS:

Temperature:
Winters are cold with average temperature from 9 to 25 degreecelcius.
Summers are dry and temperature is between 30 to 45 degrees celcius.

RAINFALL:

Tadoba experiences a humid monsoon with rainfall upto 50 inch.

TOPOGRAPHY:

Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges. Densely forested hills form Northern and Western boundary of this area. Elevation of these hills ranges from 200mts to 350mts Tadoba lake acts as the buffer between the forest and the extensive farmland which extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

GEOGRAPHY:

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smooth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and caves provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari ranges. The south part of the park is less hilly than the remainder.

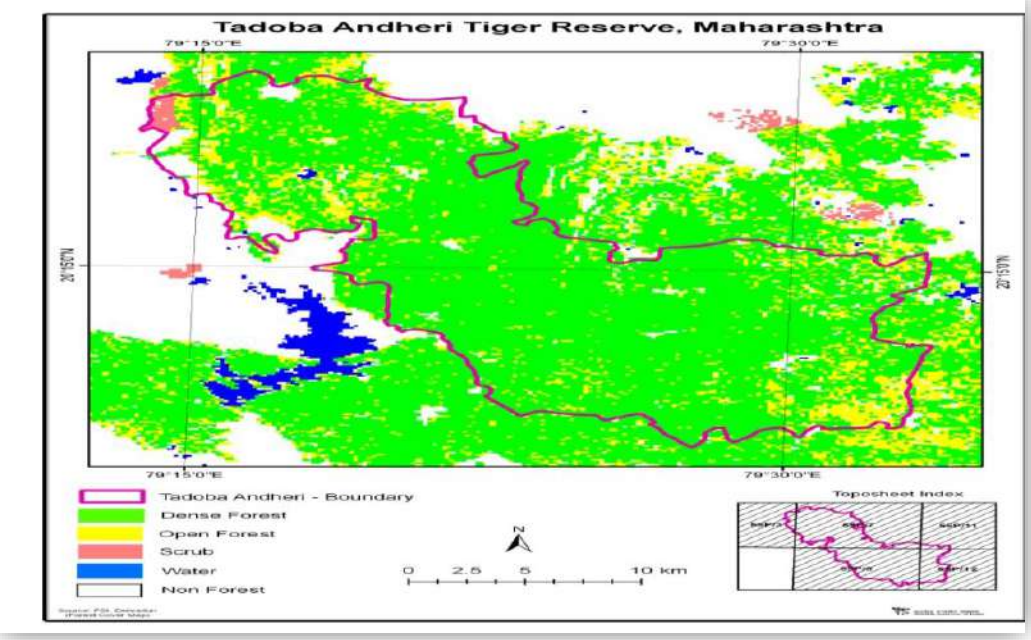


Fig: Map of Tadoba –Andhari Tiger Reserve with latitude and longitude

▪ SAFARI ZONES IN TADOBA:

The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:

Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

▪ ENTRY GATES FOR SAFARI IN TADOBA:

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai,

etc. The movement of tourists inside the park is not restricted like in other reserves, therefore one can completely enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

1. **Moharli Gate**: Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.
2. **Kuswanda:** The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.
3. **Kolara Gate:** This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.
4. **Navegaon Gate:** The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.
5. **Pangdi Gate:** The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.
6. **Zari Gate:** Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

▪ JEEP SAFARI IN TADOBA NATIONAL PARK:

The Jeep Safari is the best thing that one can experience in Tadoba National Park. The open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting a tiger and other wild animals are relatively high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more.

The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where the jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be

paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives respectively. A park guide has to accompany the jeep for security purpose. Also, the tourists can enter the park by presenting their personal information and identification papers at the gate and the foreigners by showing their passport in original.
The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

- ## SAFARI TIMING IN TADOBA:

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Moharli (Mohurli) Zone, Tadoba Zone, and Kolsa Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period	Morning		Afternoon	
	Entry	Exit	Entry	Exit
1st Oct to 30th Nov	6 AM - 8 AM	10:00 AM	2.30 PM – 4 PM	6.30 PM
1st Dec to 28th / 29th Feb	6.30 AM - 8.30 AM	11:00 AM	2 PM – 3.30 PM	6:00 PM
1st Mar to 30th April	5.30 AM – 7.30 AM	10:00 AM	3 PM – 4.30 PM	6.30 PM
1st May – 30thJune	5 AM – 7 AM	9.30 AM	3.30 PM – 5 PM	7:00 PM

- ## TO REACH TADOBA NATIONAL PARK

By Air :

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train:

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road:

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities.

Best Time to Visit Tadoba:

March to May is the best time to see tiger as summer temperatures are extremely high especially in the month of May. The monsoon begins from June to September and Vegetation and insect life come alive with the arrival of monsoon in mid June. The post monsoon starts from October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

- ## Climate and Weather of Tadoba National Park

Winters stretch from November to February and day temperatures is between 25°-30°C and the park is looks green. Summers are too hot in Tadoba as the temperature increases to 47°C; even so it is the ideal time to sight mammals near water lakes as the vegetation is also rare, increasing visibility. The monsoon breaks in June with heavy rainfall of approx.1275 mm. and humidity is around 66%.

GROUP PHOTO AT TIGER ANDHERI RESERVE

BIODIVERSITY- THE KEY OF DIVERSITY

Biodiversity is the root of all living system. The earth is home to a rich and diverse array of living organism. The biodiversity is the natural biological capital of earth and presents opportunity to all.

India has a rich varied heritage of biodiversity, consisting of a wide spectrum of habitats. Biodiversity is indeed the bedrock of all bioindustrial development in the unusually large rural sector of our country. It is of enormous importance for human welfare.

FLORA

Bamboo (*Bambusa sp*.)

Ain (*Terminalia elliptica)*

Bija (*Pterocarpus marsupium)*

Haldu (*Haldinacordifolia)*

Salai (*Boswellia serrata)*

Semal (*Bombax ceiba*)

Shisham (*Dalbergia sissoo)*

Bel (*Aegle marmelos)*

Mahua (*Madhucalongifolia)*

Palas (*Butea monsperma)*

Hirda (*Terminalia chebula)*

Tendu (*Diospyros melanoxylon)*

Kusum (*Schleicheraoleosa)*

Dhawada (*Anogeissuslatifolia)*

Karya gum (*Sterculiaurens)*

SAFARI CENSUS

We completed a total of 2 safaris in 1 Protected Area, namely, Tadoba-Andhari Tiger Reserve.

We went on all the safaris on Gypsies.

✓ TADOBA-ANDHARI TIGER RESERVE CENSUS:

- **Junona zone(Morning Safari) &**
- **Agarzari Zone (Afternoon Safari)**

AVIAN FAUNA

Species	*Scientific Name*	Count
1. Black Drongo	*Dicrurus macrocercus*	6
2. Parakeet	*Psittacula cyanocephala*	4
3. Black headed ibis	*Threskiornis melanocephalus*	7
4. Lesser egret	*Egretta garzetta*	14
5. Lesser whistling duck	*Dendrocygnajavanica*	17
6. Jacana	*Metopidius indicus*	3
7. White eyed buzzard	*Butastur teesa*	2
8. Indian magpie Robin	*Turdus migratorius*	2
9. Common Kingfisher	*Haleyon smyrnesis*	3
10. Blue kingfisher	*Alcedo atthis*	1
11. Peafowl and peahen	*Pavo cristatus*	14
12. Asian Open -billed stork	*Anastomous oscitans*	9
13. Green Bee eater	*Merops orientalis*	2
14. Red vented bulbul	*Pycnonotus cafer*	6
15. Indian roller	*Coracias benghalensis*	5
16. Rufous treepie	*Dendrocitta vagabunda*	4
17. Rose-ringed parrot	*Psittacula krameri*	3
18. Green junglefowl	*Gallus varius*	12
19. Great Cormorant	*Phalacrocoracidae aristotelis*	11

20. Indian Pond Heron	*Ardeola grayii*	3
21. Purple Heron	*Ardea purpurea*	3
22. Grey Heron	*Ardea cinerea*	6
23. Jungle owl	*Glaucidium radiatum*	1
24. Serpent Eagle	*Spilornis cheela*	3
25. Jungle Babbler	*Turdoides striata*	16
26. Grey headed Fish eagle	*Ichthyophaga ichthyaetus*	1
27. Cuckoo	*Cocomantis flabelliformis*	2
28. Yellow Footed Green Pigeon	*Treron phoenicoptera*	5
29. Spotted dove	*Spilopelia chinensis*	6
30. Common starling	*Sturnus vulgaris*	3
31. Grey hornbill	*Buceros bicornis*	2
32. Purple moorhen	*Porphyrio porphyrio*	15
33. Red wattled lapwing	*Vanellus indicus*	4
34. Koel	*Eudynamys scolopaceus*	3
35. Golden oriole	*Oriolus kundoo*	1
36. Black hooded oriole	*Oriolus xanthornus*	2
37. Spotted-billed duck	*Anus poecilorhyncga*	3
38. Indian Long tailed shrike	*Lanius schach*	1
39. Greater Coucal	*Centropus sinesis*	3
40. Common Tailorbird	*Orthotomus sutorius*	4
41. Woodpecker	*Picidae sp.*	1
42. Eurasian Thick -knee bird	*Burhinus oedicnemus*	2
43. Red spurfowl	*Galloperdix spadicea*	1
44. Little Grebe	*Tachybaptis ruficollis*	1
45. Glossy Ibis	*Plegadis falcinellus*	1
46. Osprey	*Pandion haliaetus*	1
47. House sparrow	*Passer domesticus*	1
48. Shikra	*Accipiter badius*	1
TOTAL OBSERVED:		**221**

MAMMALIAN FAUNA

Species	***Scientific Name***	**Count**
1.Spotted deer	*Axis axis*	28
2.Langur	*Semnopithecus entellus*	18
3.Sambar	*Rusa unicolor*	15
4.Barking deer	*Muntiacus muntjak*	2
5. Indian Gaur	*Bos gaurus*	3
6.Dhole	*Cuon alpines*	4
7.Sloth bear	*Melursus ursinus*	3
8.Jackal	*Canis aureous*	1
9.Wild boar	*Sus scrofa*	4
10. Blue bull (nilgai)	*Boselaphus tragocamelus*	2
11.Tiger	*Panthera tigris*	1
12.Tiger cubs	*Panthera tigris*	3
TOTAL OBSERVED		**84**

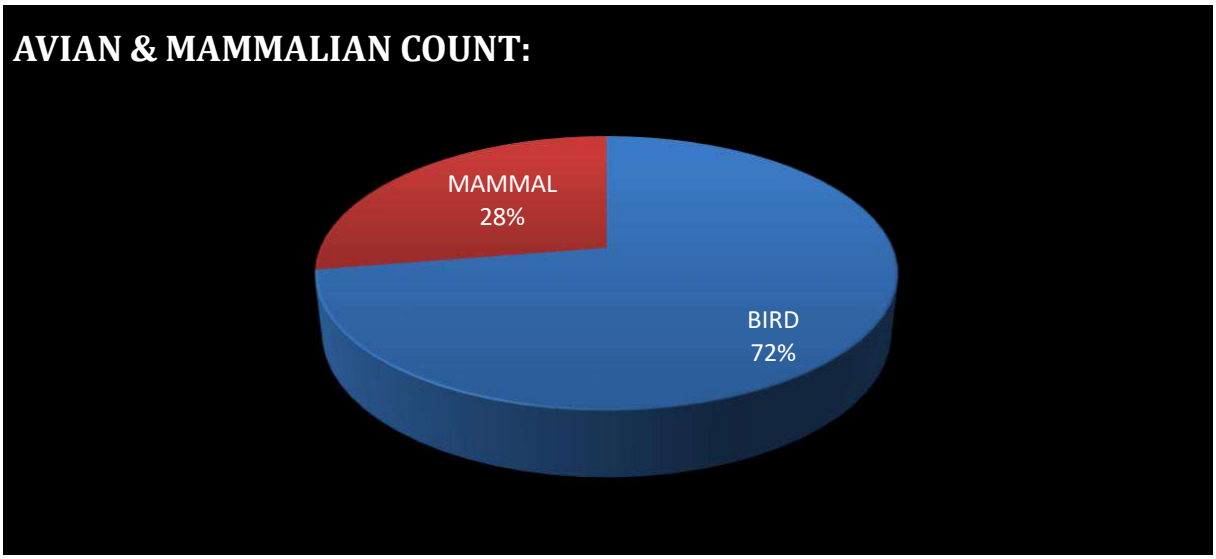


FIG: PIE-CHART OF AVIAN AND MAMMALIAN COUNTS

BIODIVERSITY INDICES

Biodiversity is one of the primary interests of ecologists, but quantifying the species diversity of ecological communities is complicated. In addition to issues of statistical sampling, the rather arbitrary nature of delineating an ecological community, and the difficulty of positively identifying all of the species present, species diversity itself has two separate components:
1.) The number of species present (*species richness*), and
2.) Their relative abundances (termed *dominance* or *evenness*).
As a result, many different measures (or indices) of biodiversity have been developed, such as

1. SHANNON INDEX

The idea behind this index is that the diversity of a community is similar to the amount of information in a code or message. It is calculated in the following way:

$$H' = -\sum\{p_i \times \ln(p_i)\}$$

Where, pi is the proportion of individuals found in species i. For a well-sampled community, we can estimate this proportion as
pi = ni/N,
where, ni is the number of individuals in species i and N is the total number of individuals in the community.
Since by definition the pis' will all be between zero and one, the natural log makes all of the terms of the summation negative, which is why we take the inverse of the sum.

- ## INTERPRETATION:

Typical values are generally between 1.5 and 3.5 in most ecological studies, and the index is rarely greater than 4. The Shannon index increases the richness of the community increase. The fact that the index incorporates both components of biodiversity can be seen as both a strength and a weakness. It is a strength because it provides a simple, synthetic summary, but it is a weakness because it makes it difficult to compare communities that differ greatly in richness. Due to the confounding of richness and evenness in the Shannon index, many biodiversity researchers prefer to stick to two numbers for comparative studies, combining a direct estimate of species richness (the total number of species in the community, S) with some measure of dominance or evenness. The most common dominance measure is Simpson's index.

SHANNON-WEINER INDEX

The Shannon-Weiner index being a measure of uncertainty, thus measures the diversity of a particular bio geographical region.

As a part of our endeavours to study the statistical aspect and interpretations of biodiversity, the various Shannon-Weiner indices of the four forests: Tadoba, Navegaon, Nagzira and Pench were calculated.

Interpretations of the mathematical data provide an insight into the biodiversity distribution of the fauna and hence are reflected by the species richness of the forests under study.

AVIAN DIVERSITY

Name	Count	Pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190
Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042
Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098
Koyel	3	0.013	-4.299	-0.058
Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149
Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073
Bulbul	6	0.027	-3.606	-0.098
White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042

Spotted billed duck	3	0.013	-4.299	-0.058
Green bee eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufoustreepie	4	0.018	-3.452	-0.109
Rose ringed parrot	3	0.013	-4.299	-0.058
Great coucal	3	0.013	-4.299	-0.058
Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002
Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002
House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thickknee bird	2	0.009	-4.705	-0.042
Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013
Purple heron	3	0.013	-4.299	-0.058
Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109
Serpent eagle	3	0.013	-4.299	-0.058
Yellow headed fish eagle	1	0.004	-5.398	-0.002
Yellow footed green pegion	5	0.023	-3.788	-0.085
Indian long tailed shrink	1	0.004	-5.398	-0.002
TOTAL				**+1.618**

MAMMALIAN DIVERSITY

Name	Count	Pi	ln(pi)	Pi*ln(pi)
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gour	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053
TOTAL				**+2.766**

Hence, the total biodiversity index of TADOBA ANDHERI TIGER RESERVE is:-

MAMMALIAN FAUNA+ AVIAN FAUNA= 4.384.

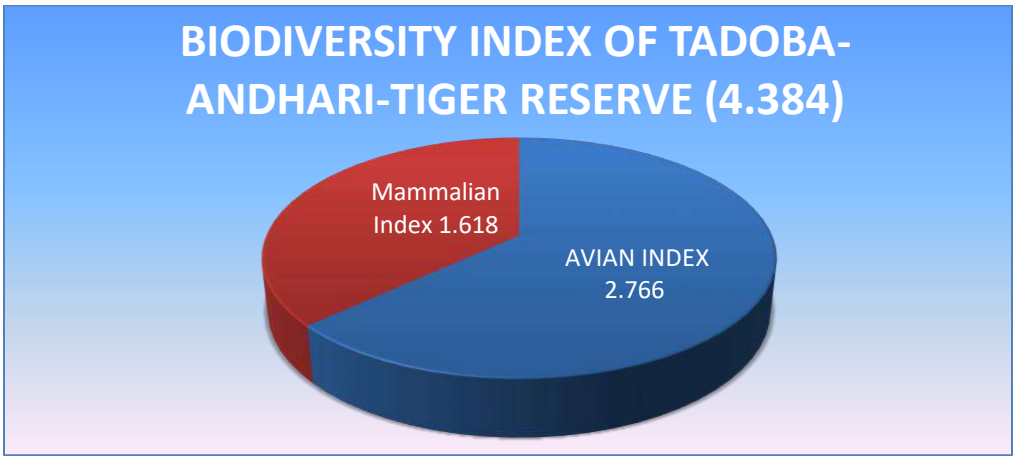


FIG: PIE CHART OF BIODIVERSITY INDEX

FAUNAL DIVERSITY

MAMMALIAN FAUNA

Melursus ursinus (Sloth bear)

Panthera tigris (Tiger)

Rusa unicolor (Sambar Deer)

Semnopithecus entellus (Langoor)

Axis axis (Spotted Deer)

Bos gaurus (Indian gaur)

AVIAN FAUNA

Threskiornis melanocephalus (Black headed Ibis)

Treron phoenicoptera (Yellow footed green pigeon)

Psittacula krameri (Rose ringed Parakeet)

Accipiter badius (Shirke)

Nest of Tailor Bird

Pavo cristatus (PeaFowl)

BUSH BEATING

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

REQUIREMENTS:

1. Umbrella
2. Stick/Staff
3. 70% Ethyl Alcohol
4. Air-tight Containers
5. Sterile Gloves
6. Tape

METHODOLOGY

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

STUDENTS CARRYING OUT BUSH BEATING

PITFALL

Pitfall-traps: For Soil-surface-active Invertebrates.

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capture more specific types of insects.

REQUIREMENTS

- While carrying out Pitfall Trapping

1. Containers
2. Soap water
3. 70% Ethyl Alcohol
4. Forceps
5. Sterile Gloves
6. Sugar

METHODOLOGY

For the Pitfall traps, four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.
- Soap water was poured into the containers to make the surface slippery and thereby ensuring the avoidance of escape attempts by the captured insect.

FIG: PITFALL TRAP

STUDENTS CARRYING OUT PITFALL.

STUDY OF QUADRATE

PRINCIPLE:-

When an ecologist wants to know how many organizations there are in a particular habitat, it would not be feasible to count them all. Instead he would be forced to count a smaller representative part of the population called sample. Sampling of plants & animals that don't move much (such as snails) can be done by using sampling square called quadrate. A suitable size of quadrate depends upon size of the organisms being sampled. For example to count plants growing on college campus one could use a quadrate with size 0.5 to 1 meter in length.

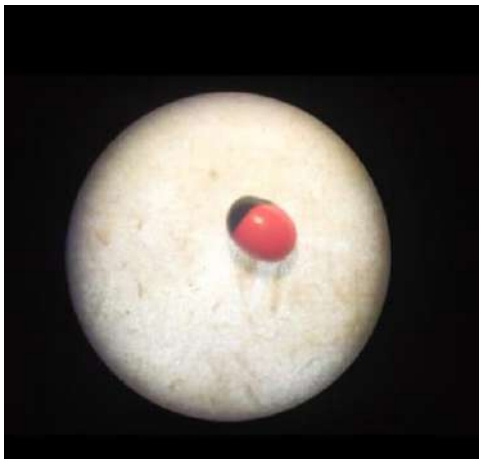
MATERIALS & METHODS OF INSECTS COLLECTION:-

1. Small garden gloves
2. Forceps
3. A kill jar containing 70% alchol
4. Insect pins
5. Ziploc packets & plastic container
6. Labels
7. Strings
8. Wood poles
9. Magnifying glass
10. Newspaper for collection

METHODOLOGY

A suitable site was selected for quadrate work to be done. An area of 1sq was measured & the region was demarcated with the help of string. The string was fixed in square form 1meter*1meter & the corners were fixed with wood poles. Thus the quadrate was formed & various species of flora & fauna were collected with the help of forceps.

STUDENTS CARRYING OUT QUADRATE STUDY



PHYLUM ARTHROPODA

FIG: INSECTS FOUND IN BUSH BEATING, PITFALL AND QUADRATE STUDY

TIGER AS A KEYSTONE SPECIES

- A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether. A keystone species is often, but not always, a predator.

- Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex species can regulate species abundance, diversity, distribution; which in turn can impact the health of terrestrial habitats.

- Additionally they provide essential food sources for the grazers and remove the sick and weak from population of prey species.

- The decimation of these tiger species can have cascading effects throughout the ecosystem they inhabit, resulting in economically and ecologically devastating consequences.

- In India's Kanha National Park, the keystone species is Tiger and the jewel has been described as "barasinha".

- Tiger is the largest of the world's great cats. Barasinha, gaur, sambar, chital, nilgai help to maintain wildlife population.

PUG MARKING

Pug marking is the term used to refer to the footprint of most animals (specially mega fauna). "Pug" means foot in Hindi (Sanskrit –*Padh*; Greek –*Ped*. Every individual animal species has a different pugmark and as such it is used for identification.

IMPORTANCE OF PUGMARK:

- Wildlife conservationists are known to catalogue pugmarks in the areas they operate.
- Pugmarks are also for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries, etc.
- It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.

TO MAKE A PLASTER CAST:

MATERIALS:

- Plaster of Paris (medical quality)
- Water
- A mug to prepare paste
- A strip of thick paper or flexible aluminium.

ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to our Principal ma'am Dr. Arpita Mukerji & Vice principal sir Dr. Supratim Das as well as our respected professors Dr. Swagata Chattopadhyay, Dr. Narayan Chandra Das, Dr. Samrat Bhattacharya, Dr. Partha Pal, Dr. Aniruddha Chatterjee, Dr. Malini kundu and our lab assistant Sri Sunil kr Pramanik who gave us the golden opportunity to do this wonderful field report , which also helped us in doing a lot of Research and enlightened us with a lot of knowledge about our subject and animal behavior. Secondly l would also like to thank my classmates who helped me in finalizing this report within the limited time frame. Without the help it wouldn't have been possible to complete the field report of our memorable excursion to Tadoba-andhari tiger reserve.

Date: 13.03.2021

UNIVERSITY OF CALCUTTA

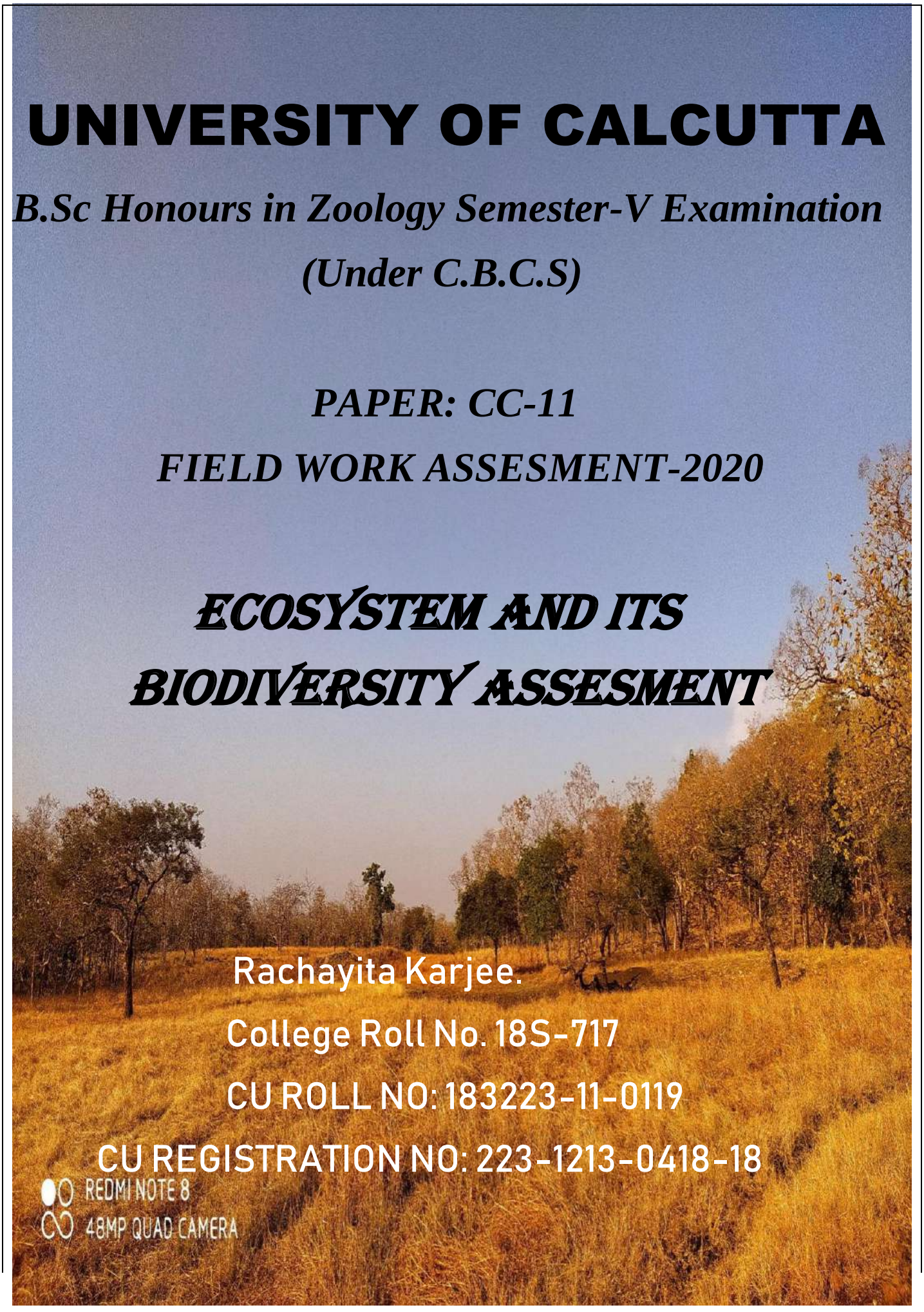
B.Sc Honours in Zoology Semester-V Examination

(Under C.B.C.S)

PAPER: CC-11

FIELD WORK ASSESMENT-2020

ECOSYSTEM AND ITS BIODIVERSITY ASSESMENT



Rachayita Karjee.

College Roll No. 18S-717

CU ROLL NO: 183223-11-0119

CU REGISTRATION NO: 223-1213-0418-18

AIM OF EXCURSION :

The purpose of Zoological excursion is to gain a much deeper knowledge about the topic related to the subject, such as wildlife, nature and environment with the help of practical demonstration along with theoretical factors. While their purpose is essential to endure, they can also be a fun bonding experience for everyone involved. Moreover without practical knowledge, the study of bio-science is incomplete. It also provides a scope to study wildlife and observe animals and their behaviours in their natural habitat.

Hence zoological excursion helps us to come in close contact with the flora and fauna of various places with different climatic conditions and atmospheric variations and in better understanding of the relation between flora and fauna.

IMPORTANCE OF EXCURSION NOTEBOOK:

An outstanding field notebook serves many potential purpose

1. It is valuable record of what we have seen, heard, discussed, and thought about in the field.
2. It may contain the data which will lead to an oral presentation , a paper or a thesis.
3. It may be graded portion of a course.

BIODIVERSITY IS THE KEY OF DIVERSITY:

Biodiversity is the most commonly used to replace the more clearly defied and long established terms, species biodiversity and species richness. Biologists most often define the biodiversity as the “Totality of genes, species and ecosystem of a region”. Biodiversity is the degree of variation of life. This can refer to genetic variation, species variation or ecosystem variation within an area, biome or planet. Terrestrial biodiversity tends to be highest at low latitudes near the equator, which seems to be the result of the worm climate and high primary productivity.

Marine biodiversity tends to be highest among costs in Western Pacific, when sea surface temperature is highest and in mid-latitudinal band in all oceans and has been increasing through time but will be likely to slowdown in the future. Rapid environmental changes typically cause mass extinctions.

One estimate is that <1%-3% of the species that have existed on the earth are extant. The period since the emergence of humans have displayed an ongoing biodiversity reduction and an accompanying loss of biodiversity- named the Holocene Extinction.

EXCURSION DIARY:

TOUR PROGRAMME OF TADOBA NATIONAL PARK:

Date of Journey:- 23rd February2020

Train No. & Name:- 12860 Gitanjali Express

Departure time & Place:- 13:40hrs Howrah Station

Reporting Time & Place:- 12:00hrs at Howrah Station Complex in front of Mail and Express Inquiry.

DETAILS of TOUR PROGRAMME

23/02/2020:-

Start from Howrah Station at 13:40 by 12860 Gitanjali for Nagpur Station.

24/02/2020:-

Reaching Nagpur Station at 07:20hrs. Start from Nagpur Station at 08:00hrs by Bus for Tadoba National Park. Reaching Tadoba at 12.00hrs and transfer at Forest Rest House and Dormitory.

Afternoon and Evening : Biodiversity specimen collection studies. Night stay at Tadoba.

25/02/2020:-

Morning and Afternoon coverage Tadoba National Park Safari (Junona and Agarjhari Zone) by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.

Evening : Biodiversity studies; Night stay at Tadoba.

26/02/20:-

Start from Tadoba at 08.00hrs by Bus for Bor.

Reaching Bor at 12.00hrs and transfer at Forest Rest House and Dormitories.

Afternoon and Evening : Biodiversity specimen collection studies; Night stay at Bor.

27/02/20:-

Morning and Evening coverage Bor National Park Safari (Bordharan) by gypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.

Evening : Biodiversity studies; Night stay at Bor.

28/02/20:-

Start from Bor at 06.00hrs by Bus for Nagpur Station. Reaching Nagpur Station at 09.00hrs. Start from Nagpur Station at 10.10hrs by 12129 Azad Hind Express for Howrah Station.

29/02/20:- Reaching **Howrah Station** at 04.15hrs.

END OF TOUR.

Essential things which to be carry on –

1. Essential Medicine
2. Original Photo I-Card.
3. Woolen Clothes, light blanket or thick bedsheet.
4. Clothes and shoes fit for jungle safari.
5. Torch and Candles
6. Chain and lock
7. Umbrella
8. Notebook and pen.
9. Soil digging apparatus.
10. Small plastic containers, soap powder.
11. News papers, plastic bags, ropes
12. Knife, scissors, forceps, brush

Individual have to bear –

1) Camera Charges where it necessary.

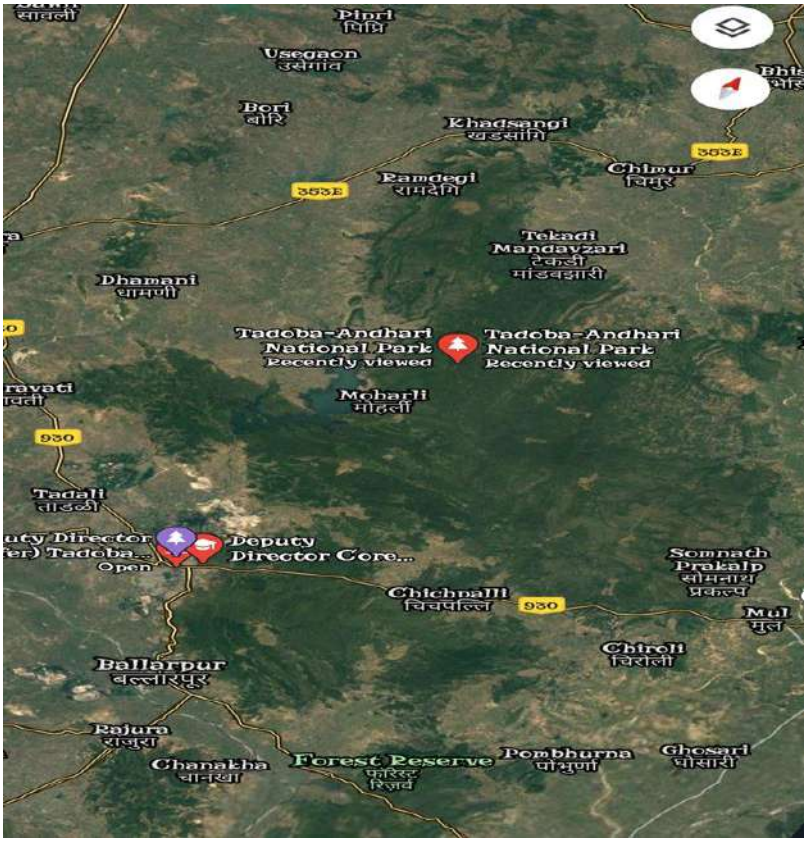
2) Food coverage starts from 23/2/2020 Evening Tea Snacks. Dinner and 1 Bottle Mineral Water will be provided on the Train.

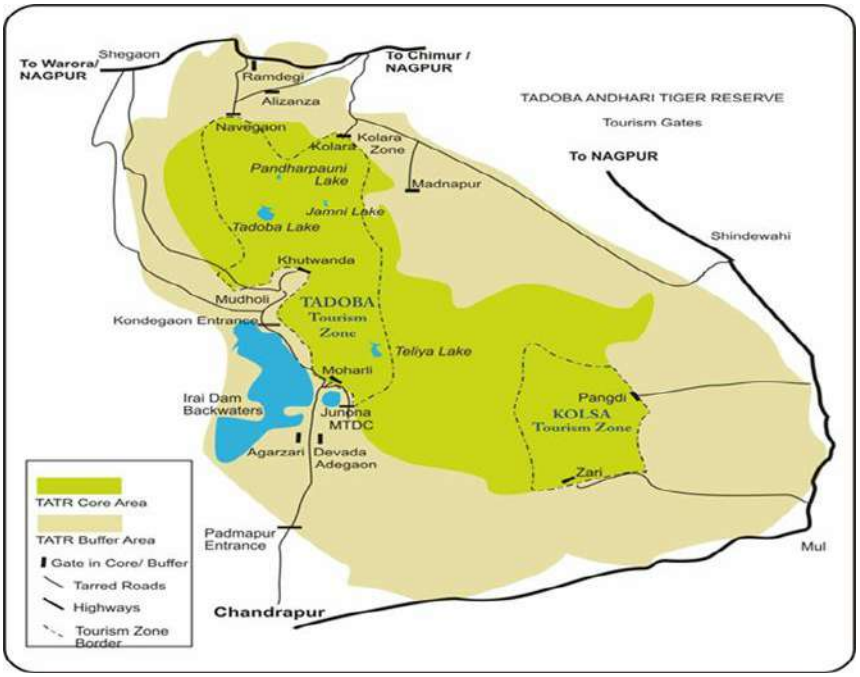
GROUP PICTURE AT HOWRAH STATION

TADOBA ANDHARI TIGER RESERVE

Location : Chandrapur district, Maharashtra, India.

Coordinates: 20.2484° N, 79.3607° E





MAPS OF TADOBA NATIONAL PARK

Entry Gates for Safari in Tadoba:

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai, etc. The movement of tourists inside the park is not restricted like in other reserves, therefore one can completely enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

1. Moharli Gate: Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.

2. Kuswanda: The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.

3. Kolara Gate: This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.

4.Navegaon Gate: The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.

5.Pangdi Gate: The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.

6.Zari Gate: Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

GROUP PICTURE AT TADOBA NATIONAL PARK

ON THE WAY TO FIELD WORK

List of Animals and Birds Spotted During Our Safari in Tadoba National Park:

Jeep Safari in Tadoba

Sr. no.	Name of the Organisms		Number
	Common name	Scientific name	
	MAMMALS		
1.	Spotted Deer	*Axis axis*	36
2.	Indian Gaur	*Bos gaurus*	29
3.	Grey Langur	*Semnopithecus vetulus*	4
4.	Tigress	*Pnathera tigris tigris*	3
5.	Barking Deer	*Muntiacus muntjak*	1
6.	Sambar Deer	*Rusa unicolor*	5
7.	Wild Boar	*Sus scrofa*	5
8.	Sloth Bear	*Melursus ursinus*	1
9.	Tiger cub	*Panthera tigris tigris*	3
	Total count		*87*
	BIRDS		
5.	Grey Jungle Fowl	*Gallus sonneratii*	6

6.	House Sparrow	*Passer domesticus*	1
7.	Spotted Dove	*Spilipelia chinensis*	3
8.	Black Drongo	*Dicrurus macrocercus*	6
9.	Little egret	*Egretta garzetta*	9
10.	Rufous Treepie	*Dendrocitta vegabunda*	4
11.	Jungle Babbler	*Turdoides striata*	10
12.	Crested serpent Eagle	*Spilornis cheela*	1
13.	Red Vented Bulbul	*Pycnonotus cafer*	6
14.	Blackheaded Ibis	*Threskiornis melanocephalus*	11
15.	Common starling	*Sturnus vulgaris*	1
16.	Peacock	*Pavo cristatus*	15
17.	Shikra	*Accipiter babius*	1
18.	White throated kingfisher	*Halcyon smyrnensis*	2
19.	Indian spotted billed duck	*Anus poecilorhyncha*	2
20.	Whistling duck	*Dendrocygna javanica*	20
21.	Green bee eater	*Merops orientalis*	1
22.	Little grebe	*Tachybaptus ruficollis*	6
23.	Grey hornbill	*Ocyceros birostris*	2
24.	Yellow footed green pigeon	*Trenon phoenicoptera*	2

25.	Open billed stork	*Anastomus oscitans*	4
26.	Cotton pygmy goose	*Nettapus coromandelianus*	1
27.	Indian Roller	*Coracias benghalensis*	4
28.	Cattle egret	*Bubulcus ibis*	2
29.	Bronze winged jacana	*Metopidius indicus*	2
30.	Eurasian thick knee	*Burhinus oedicnemus*	6
31.	Red wattled lapwing	*Vanellus indicus*	1
32.	Indian cormorants	*Phalacrocorax fuscicollis*	15
33.	Magpie robin	*Copsychus saularis*	1
34.	Glossy ibis	*Plegadis falcinellus*	1
35.	Rose ring parakeet	*Psittacula krameri*	4
36.	Lesser adjutant stork	*Leptoptilos javanicus*	1
	Total count		157

Mammalian fauna of TADOBA

A. Tigress (*Panthera tigris tigris*)

B. Sloth Bear (*Melursus ursinus*)

C. Sambar deer (*Rusa unicolor*)

D. Indian spotted dear *(Axis axis)*

E. Wild Boar *(Sus scrofa)*

Avian fauna of TADOBA

F. Indian Roller (*Corcacias benghalensis*)

G. Indian Peacock (*Pavo cristatus*)

H. Black headed Ibis (*Threskiornis melanocephalus*)

Bush beating

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

Requirements:

1. Umbrella
2. Stick / staff
3. 70% ethyl alcohol
4. Air tight containers
5. Sterile gloves
6. Tape

Methodology:

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

Fig. Bush Beating

Fig. specimen collection after bush beating

PITFALL

Pitfall-traps: For Soil-surface-active Invertebrates.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capture more specific types of insects.

Requirements:

1) Container; 2) Soap water; 3) 70% Ethyl alcohol; 4) Forceps;

5) Sterile gloves; 6) Sugar.

Methodology:

For the Pitfall traps, four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.

Soap water was poured into the containers to make the surface slippery and thereby ensuring the avoidance of escape attempts by the captured insect.

- The pitfall trap was allowed to remain intact for about 6 hours. The collected insects were then poured into containers with 70% ethyl alcohol.
- Ethyl Alcohol was used as a preservative for the soft bodied animals as it maintained their elemental composition.

Fig: Specimen collection from pitfall

Fig: Setting of Pitfall

Quadrat study

When an ecologist wants to know how many organisms are there in a particular habitat, it would not be feasible to count them all. Instead, he or she would need to count a smaller representative part of the population, called a sample .Sampling of plants or animals that do not move much (such as snails) can be done using sampling square called – **Quadrat.** A suitable size of quadrat depends on the organisms being sampled. For example, to count plants growing on a school field, one could use a quadrate sides 0.5 or 1 meter in length.

Requirements:

1) Small garden shovels;

2) Forceps;

3) A kill jar containing 70% ethyl alcohol;

4)Insect pins;

6)Magnifying glass,

7) Newspaper for collection;

8) string,

9) wooden poles

Methodology: a suitable site was selected for quadrat work to be done. An area of 1sq was measured and the region was demarcated with the help of string. The string was fixed in square form 1mt*1mt & the corners were fixed with wooden poles. Thus the quadrat was formed & various species were collected with the help of forceps.

Fig: Setting of quadrat

Micro specimens collected from Tadoba

Specimen-1

Secimen-2

Specimen-3

Specimen:4

Acknowledgement:

We would like to extend our gratitude to our respected Principal Dr.Arpita Mukherji, our respected vice Principal, Dr.Supratim Das,our Head of the department Dr. Narayan Chandra Das,our accompanying professor Dr. Swagata Chattopadhyay and Mr. Sunil Pramanik, alongside to all the professors in our department, who have all helped us all along, immensely. We are highly indebted to them for such an enriching experience that the college heads have solely arranged for the betterment of quality of learning for the students .It has been a marvellous opportunity to observe and learn amidst the inherent wonders of nature. This excursion has helped all of the classmates to work better as a team and we could all broaden our horizons in terms of ecological survey.

Date of Submission : 15/03/2021

SEMESTER 5

ZOOLOGY FIELD REPORT

CC11(ECOLOGY)

RITTIKA DUTTA

ROLL NO.:183223-11-0106

REGISTRATION NO.:223-1211-0421-18

COLLEGE ROLL NUMBER:18S-730

INTRODUCTION

AIM OF EXCURSION

The purpose of zoological excursion is to gain a much deeper knowledge about the topics related to the subject such as wildlife,nature and environment with the help of practical demonstration along with theoretical facts.While their purpose is essentially to educate,they can also be fun bonding experience for everyone involved. Moreover without practical knowledge,the study of bio-science is incomplete. It also provides scope to study wildlife and observe animals and their behaviours in their natural habitat.

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IMPORTANCE OF EXCURSION NOTEBOOK

An outstanding field notebook serves many potential purposes

1.It is a valuable record of what you have seen,heard,discussed and thought about in the field.

2.It may contain the data which will lead to an oral presentation,and/or a thesis.

3.It may be a graded portion of a curve.

4.It may be something you and your relatives will find interesting decades in the future.

FIELD DATA COLLECTION PURPOSE OF FIELD NOTES:

- MONEY: Field books contain data which has been collected over weeks or months.The cost of collecting the data can range in the thousand of dollars.

- LITIGATION:Property surveys are subject to court review.The status of the field book can be a very important factor in litigation.
- EFFICIENCY:The information in the field book is used by office personnel to make drawings or calculations.Complete and correct notes are essential.

BASIC REQUIREMENTS FOR GOOD NOTES

>ACCURACY:By far the most important aspect of field notes.
>INTEGRITY:(complete) if the field crew fails to collect all important data,costly delays can occur in the office.
>ARRANGEMENT:Following a standard note format,save time and money when trying to follow notes.
>LEGIBILITY:Major errors can occur if your notes cant be read easily.
>CLARITY:well planned surveys with clear special notations and sketches will great add to the understanding of the survey.

BIODIVERSITY IS THE KEY OF DIVERSITY

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Marine biodiversity tends to be highest along coasts in the Western Pacific,when sea surface temperature is highest and in-latitudinal band in all oceans.Biodiversity generally tends to cluster in hotspots,and has been increasing through time but will be likely to slow in the future. Rapid environmental changes typically cause mass extinctions.

One estimate is that <1%-3% of that species that have existed on earth are extant. The period since the emergence of humans has displayed ongoing biodiversity reduction and an accompanying loss of genetic diversity. Named the Holocene extinction,the reduction is caused primarily by human impacts,particularly habitat destruction.

Conversely,biodiversity impacts human health in a number of ways,both positively and negatively.

The Limited Nations designated 2011-2020 as the Limited Nations Decade on Biodiversity

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE

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Departure Time & Place :- 13:40hrs Howrah Station

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Night stay at Tadoba.

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29/02/20:- Reaching Howrah Station at 04.15hrs.

The Tour Ends

ACCOMPANYING PERSONS :-

1. Prof. Swagata Chattopadhyay
2. Sri Sunil Kr Pramanik

TADOBA-ANDHARI TIGER RESERVE

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

Location

Coordinates: 20◦10′N 79◦24′E

Total area covered by Tadoba National Park is 116.55 sq.kms.

It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.

The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the Tadoba National Park, created in the year 1955.

Significance

Tadoba National park contains some of the best forest tracks and is endowed with rich biodiversity. It is famous for its natural heritage. Tadoba is an infinite treasure trove of innumerable species of trees and plants - and wildlife that includes Tigers, Panthers, Sloth Bears, Hyenas, Jackals, Wild Dogs, Bison, Barking Deer, NilGai, Sambar, and Cheatal.

Known for its rich biodiversity, the Tadoba National Park is nothing less than a paradise for wildlife enthusiasts. Owing to the presence of the big cats, the park was announced as the 41st Tiger Reserve of India. Along with the tigers, the park provides a home to the Wild Boar, Leopard, Spotted Deer, Rusty Spotted Cat, Indian Mouse Deer, Sambar, Gaur, Sloth Beer, Four Horned Antelope, Flying Squirrel and so on.

Etymology

The word 'Tadoba' is derived from the name of God "Tadoba" or "Taru," which is praised by local tribal people of this region and "Andhari" is derived from the name of Andhari river that flows in this area

Type of Forest

Tadoba reserve is a predominantly southern tropical dry deciduous forest

Physical Factors

Temperature:

Winters are cold with average temperature from 9 to 25 degree celsius.
Summers are dry and the temperature is between 30 to 45 degrees celsius.

Rainfall:

Tadoba
experiences a humid monsoon with rainfall upto 50 inch.

Topography

Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges. Densely forested hills kiform Northern and Western boundary of this area. Elevation of these hills ranges from 200mts to 350mts
Tadoba lake acts as the buffer between the forest and the extensive farmland which extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

Geography

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This

includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smooth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and caves provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari ranges. The south part of the park is less hilly than the remainder.

FAUNA:-

Mammals: 65 of the keystone species Bengal tiger, Indian Leopard, Sloth bear, Wild dog, Jackal, Sambar, Gaur, Nilgai, Dhole, striped Hyena, small Indian civet, jungle cats, Indian Bison, Barking Deer, Blue Bull, Spotted Dee, Chausingha, Ratel, Flying Squirrel, Wild Boar, Langur, marsh Crocodile.

Reptiles: Indian python, common Indian monitor. Terrapins, Indian star tortoise, Indian cobra Russel's viper

Birds: 195 species of birds. The grey-headed fish eagle, the crested serpent eagle, the changeable hawk-eagle,the raptors.

Other interesting species include the orange-headed thrush, Indian pitta, crested treeswift, stone curlew, crested honey buzzard, paradise flycatcher, bronze-winged jacana and lesser goldenbacked woodpecker. Warblers and the black-naped blue flycatcher .

74 species of butterflies have been recorded including the pansies, monarch, Mormons and swordtails. Insect species include the endangered danaid egg-fly, great eggfly. Dragonflies, stick insects, jewel beetles and the praying mantis, giant wood spider, red wood, wolf spiders, crab spiders and lynx spiders. The most recent census, carried out in 2012, found that the core area has 43 tigers. There are another 22 tigers in the buffer area, and a further 35 in the area surrounding the park.

people can roam here throughout the year, thus they can be witness to spot the tiger and other opulence wild species along with the beautiful dense forest.

Flora

Bamboo	Bambusa sp.
Ain	Terminalia elliptica
Bija	Pterocarpus marsupium
Haldu	Haldina cordifolia
Salai	Boswellia serrata
Semal	Bombax ceiba
Shisham	Dalbergia sissoo
Bel	Aegle marmelos
Mahua	Madhuca longifolia
Palas	Butea monsperma
Hirda	Terminalia chebula
Tendu	Diospyros melanoxylon
Kusum	Schleichera oleosa
Dhawada	Anogeissus latifolia

Karya gum Sterculia urens

Safari Zones in Tadoba

The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:

Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

Entry Gates for Safari in Tadoba

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai, etc. The movement of tourists inside the park is not restricted like in other reserves, therefore one can completely enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

1. **Moharli Gate:** Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is

entry of nine vehicles each morning and evening for tiger safari from this gate.

2. **Kuswanda**: The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.

3. **Kolara Gate:** This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.

4. **Navegaon Gate:** The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.

5. **Pangdi Gate:** The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.

6. **Zari Gate**: Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

Jeep Safari in Tadoba National Park

The Jeep Safari is the best thing that one can experience in Tadoba National Park. The open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting a tiger and other wild animals are relatively high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more.

The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where kithe jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives

respectively. A park guide has to accompany the jeep for security purpose.

Also, the tourists can enter the park by presenting their personal information and identification papers at the gate and the foreigners by showing their passport in original.

The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

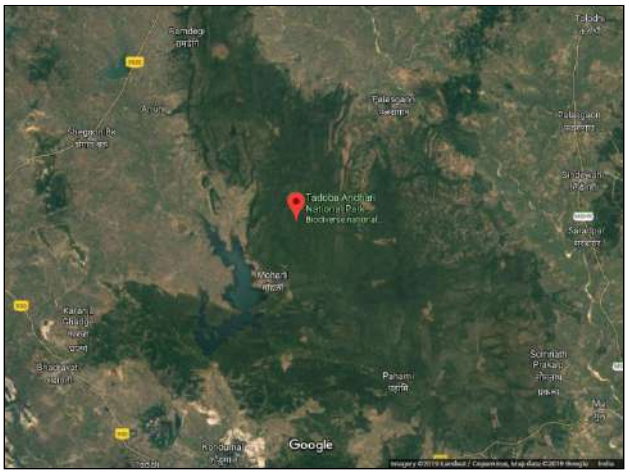
Group photograph

Safari

Safari Timing in Tadoba

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Moharli (Mohurli) Zone, Tadoba Zone, and Kolsa Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period	Morning		Afternoon	
	Entry	Exit	Entry	Exit
1st Oct to 30th Nov	6 AM - 8 AM	10:00 AM	2.30 PM – 4 PM	6.30 PM
1st Dec to 28th / 29th Feb	6.30 AM - 8.30 AM	11:00 AM	2 PM – 3.30 PM	6:00 PM
1st Mar to 30th April	5.30 AM – 7.30 AM	10:00 AM	3 PM – 4.30 PM	6.30 PM
1st May – 30thJune	5 AM – 7 AM	9.30 AM	3.30 PM – 5 PM	7:00 PM



Location of Tadoba Tiger Reserve on map

National parks in Maharashtra

To Reach Tadoba National Park

By Air

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities.

Best Time to Visit Tadoba

March to May is the best time to see tiger as summer temperatures are extremely high especially in the month of May. The monsoon begins from June to September

and Vegetation and insect life come alive with the arrival of monsoon in mid June. The post monsoon starts from October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

Climate and Weather of Tadoba National Park

Winters stretch from November to February and day temperatures is between 25°-30°C and the park is looks green. Summers are too hot in Tadoba as the temperature increases to 47°C; even so it is the ideal time to sight mammals near water lakes as the vegetation is also rare, increasing visibility. The monsoon breaks in June with heavy rainfall of approx.1275 mm. and humidity is around 66%.

BIODIVERSITY

Biodiversity refers to the variety and variability of life on Earth. Biodiversity typically measures variation at the genetic, species, and ecosystem level. Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.

Biodiversity is not distributed evenly on Earth, and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversity is usually highest along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans.

There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

Types of Biodiversity:

1.Genetic Diversity-

- Different genes and combinations of genes within populations
- Allows population of a species to adopt to environmental changes

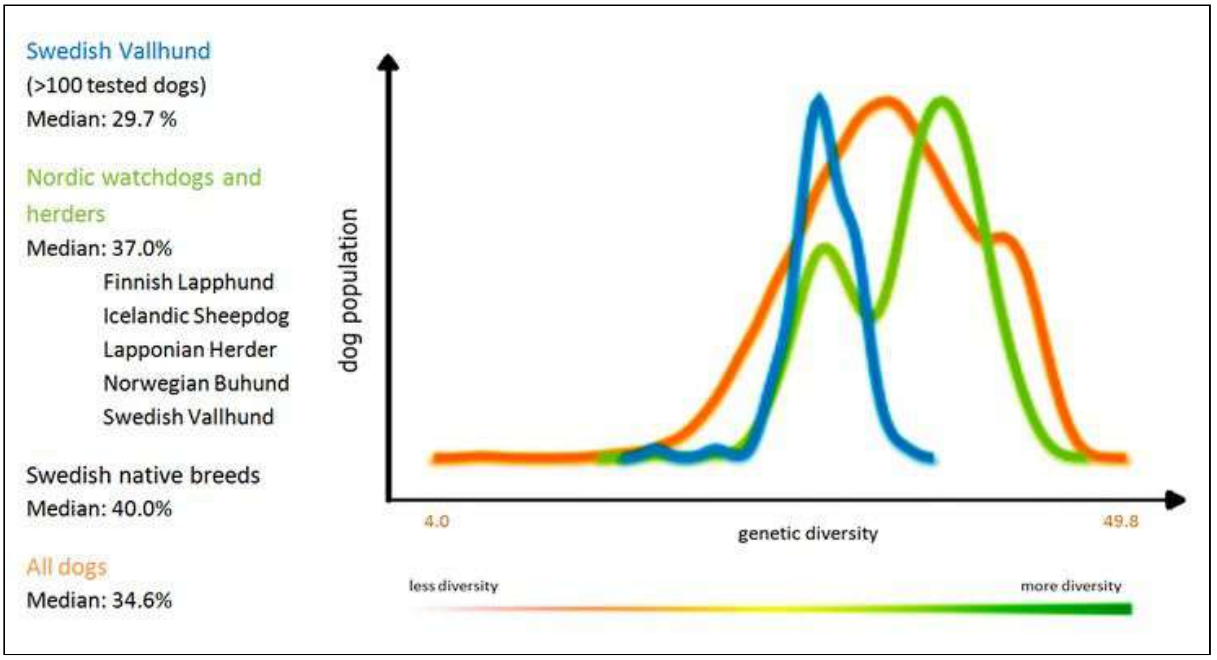


Fig: Genetic Diversity of Swedish Vallhund compared to other breeds[1]

2.Species Diversity-

- Different kinds of organism, relationships among species
- Refers to the number of kinds of species being found

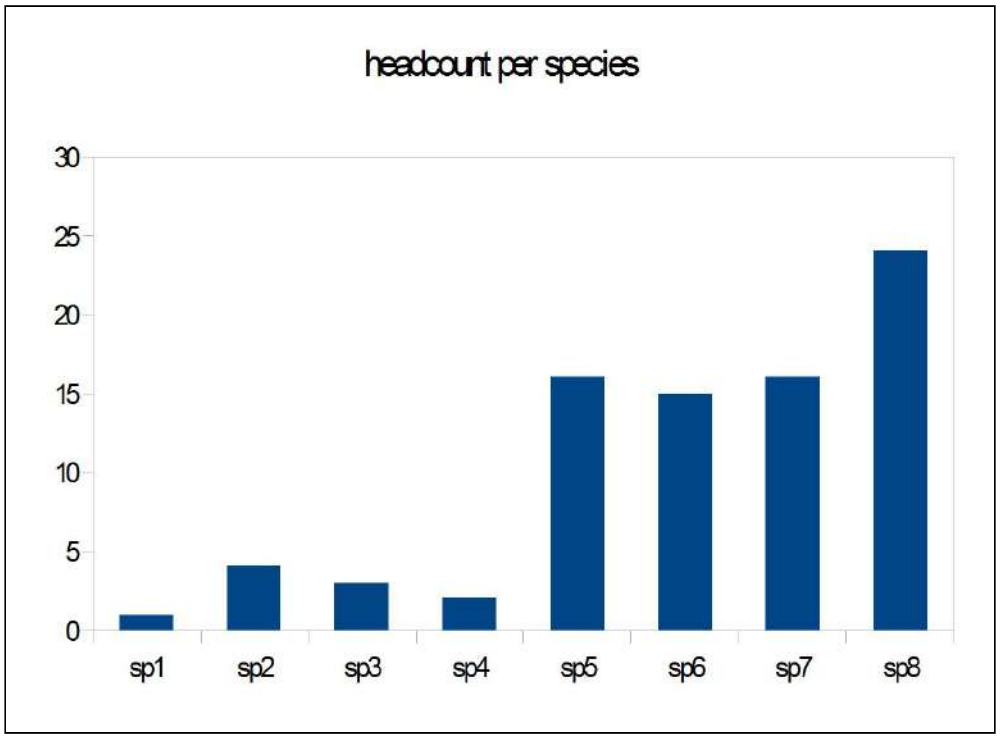


Fig: Fluctuations in species number[2]

3.Ecological Diversity-

- Different habitats, niches, species interactions
- An assemblage of species living in the same area and interacting with an environment

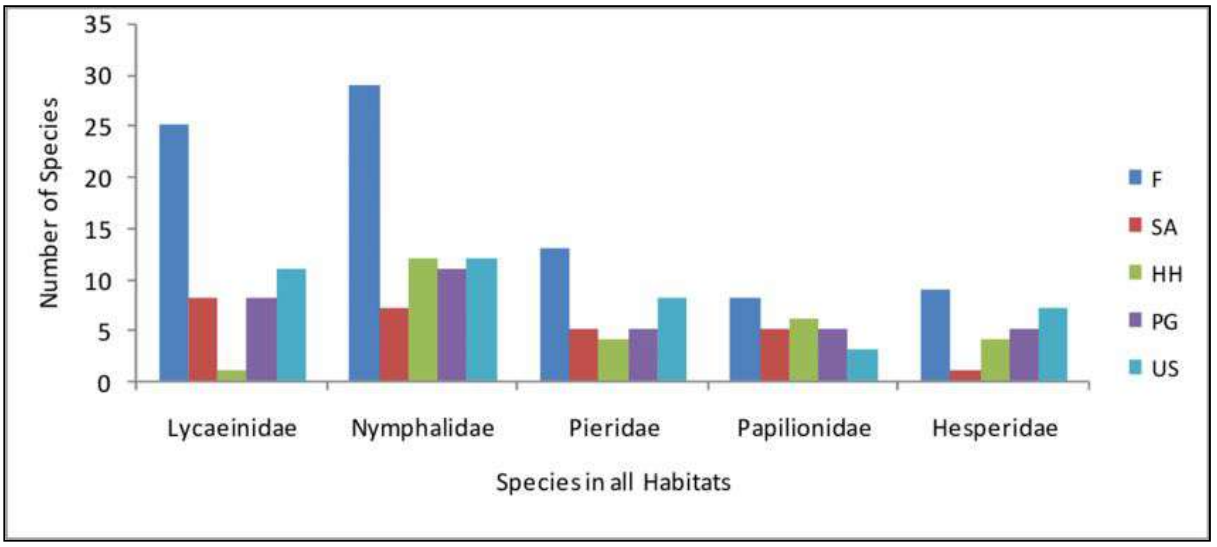


Fig: Species diversity in various Habitats[3]

Safari Census

We completed a total of 4 safaris in 2 Protected Areas, namely, Tadoba Tiger Reserve, Bor Tiger Reserve.

Requirements

1. Notebook and Pen – It was used to keep a note of the species we were able to see and keep a count of them.
2. Binoculars – Olympus Binoculars were used to look far into the depths of the dense forest and high up on the trees to identify the various species, mostly birds, and keep a count.
3. Camera – A Nikon D5200 Digital SLR camera, with a 70-300mm telephoto lens was used to keep photographic evidence of the species observed in their natural habitat.

Safari Census

We completed a total of 2 safaris in 1 Protected Area, namely, Tadoba-Andhari Tiger Reserve.

We went on all the safaris on Gypsies.

Tadoba-Andhari Tiger Reserve Census:

- Junona zone(Morning Safari) &
- Agarzari Zone (Afternoon Safari)

Avian Fauna

Species	*Scientific Name*	Count
1. Black Drongo	*Dicrurus macrocercus*	6
2. Parakeet	*Psittacula cyanocephala*	4
3. Black headed ibis	*Threskiornis melanocephalus*	7

4. Lesser egret	*Egretta garzetta*	14
5. Lesser whistling duck	*Dendrocygnaj avanica*	17
6. Jacana	*Metopidius indicus*	3
7. White eyed buzzard	*Butastur teesa*	2
8. Indian magpie Robin	*Turdus migratorius*	2
9. Common Kingfisher	*Haleyon smyrnesis*	3
10. Blue kingfisher	*Alcedo atthis*	1
11. Peafowl and peahen	*Pavo cristatus*	14
12. Asian Open -billed stork	*Anastomous oscitans*	9
13. Green Bee eater	*Merops orientalis*	2
14. Red vented bulbul	*Pycnonotus cafer*	6
15. Indian roller	*Coracias benghalensis*	5
16. Rufous treepie	*Dendrocitta vagabunda*	4
17. Rose-ringed parrot	*Psittacula krameri*	3
18. Green junglefowl	*Gallus varius*	12
19. Great Cormorant	*Phalacrocoracidae aristotelis*	11
20. Indian Pond Heron	*Ardeola grayii*	3
21. Purple Heron	*Ardea purpurea*	3
22. Grey Heron	*Ardea cinerea*	6
Species	***Scientific name***	**Count**

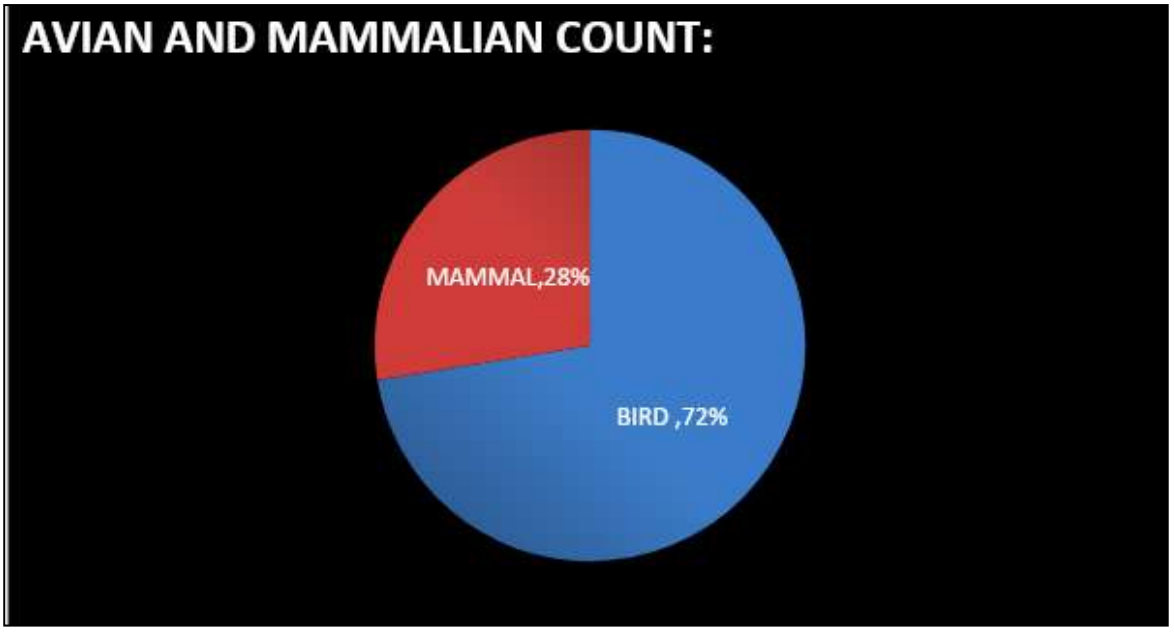
23. Jungle owl	*Glaucidium radiatum*	1
24. Serpent Eagle	*Spilornis cheela*	3
25. Jungle Babbler	*Turdoides striata*	16
26. Grey headed Fish eagle	*Ichthyophaga ichthyaetus*	1
27. Cuckoo	*Cocomantis flabelliformis*	2
28. Yellow Footed Green Pigeon	*Treron phoenicoptera*	5
29. Spotted dove	*Spilopelia chinensis*	6
30. Common starling	*Sturnus vulgaris*	3
31. Grey hornbill	*Buceros bicornis*	2 2
32. Purple moorhen	*Porphyrio porphyrio*	15
33. Red wattled lapwing	*Vanellus indicus*	4
34. Koel	*Eudynamys scolopaceus*	3
35. Golden oriole	*Oriolus kundoo*	1
36. Black hooded oriole	*Oriolus xanthornus*	2
37. Spotted-billed duck	*Anus poecilorhyncga*	3
38. Indian Long tailed shrike	*Lanius schach*	1
39. Greater Coucal	*Centropus sinesis*	3

40. Common Tailorbird	*Orthotomus sutorius*	4
41. Woodpecker	*Picidae sp.*	1
42. Eurasian Thick -knee bird	*Burhinus oedicnemus*	2
43. Red spurfowl	*Galloperdix spadicea*	1
44. Little Grebe	*Tachybaptis ruficollis*	1
45. Glossy Ibis	*Plegadis falcinellus*	1
46. Osprey	*Pandion haliaetus*	1
47. House sparrow	*Passer domesticus*	1
48. Shikra	*Accipiter badius*	1
TOTAL OBSERVED:		**221**

Mammalian Fauna

Species	***Scientific Name***	**Count**
1.Spotted deer	*Axis axis*	28
2.Langur	*Semnopithecus entellus*	18
3.Sambar	*Rusa unicolor*	15
4.Barking deer	*Muntiacus muntjak*	2
5. Indian Gaur	*Bos gaurus*	3

6.Dhole	*Cuon alpines*	4
7.Sloth bear	*Melursus ursinus*	3
8.Jackal	*Canis aureous*	1
9.Wild boar	*Sus scrofa*	4
10. Blue bull (nilgai)	*Boselaphus tragocamelus*	2
11.Tiger	*Panthera tigris*	1
12.Tiger cubs	*Panthera tigris*	3
TOTAL OBSERVED		**84**



Biodiversity Indices

Biodiversity is one of the primary interests of ecologists, but quantifying the species diversity of ecological communities is complicated. In addition to issues of statistical sampling, the rather arbitrary nature of delineating an ecological community, and the difficulty of positively identifying all of the species present, species diversity itself has two separate components:

1.) the number of species present (*species richness*), and

2.) their relative abundances (termed *dominance* or *evenness*).

As a result, many different measures (or indices) of biodiversity have been developed, such as

1. ***Shannon index***

The idea behind this index is that the diversity of a community is similar to the
amount of information in a code or message. It is calculated in the following way:

$$H' = -\sum\{p_i \times \ln(p_i)\}$$

Where, pi is the proportion of individuals found in species i. For a well-sampled community, we can estimate this proportion as
pi = ni/N,
where, ni is the number of individuals in species i and N is the total number of individuals in the community.
Since by definition the pis' will all be between zero and one, the natural log makes all of the terms of the summation negative, which is why we take the inverse of the sum.

Mammalian diversity

Name	Count	pi	ln(pi)	Pi*ln(pi)

Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gour	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053

Summed Biodiversity Index:

Hm=(+1.618)

Avian diversity

Name	Count	pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190
Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042
Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098
Koyel	3	0.013	-4.299	-0.058

Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149

Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073
Bulbul	6	0.027	-3.606	-0.098
White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042
Spotted billed duck	3	0.013	-4.299	-0.058

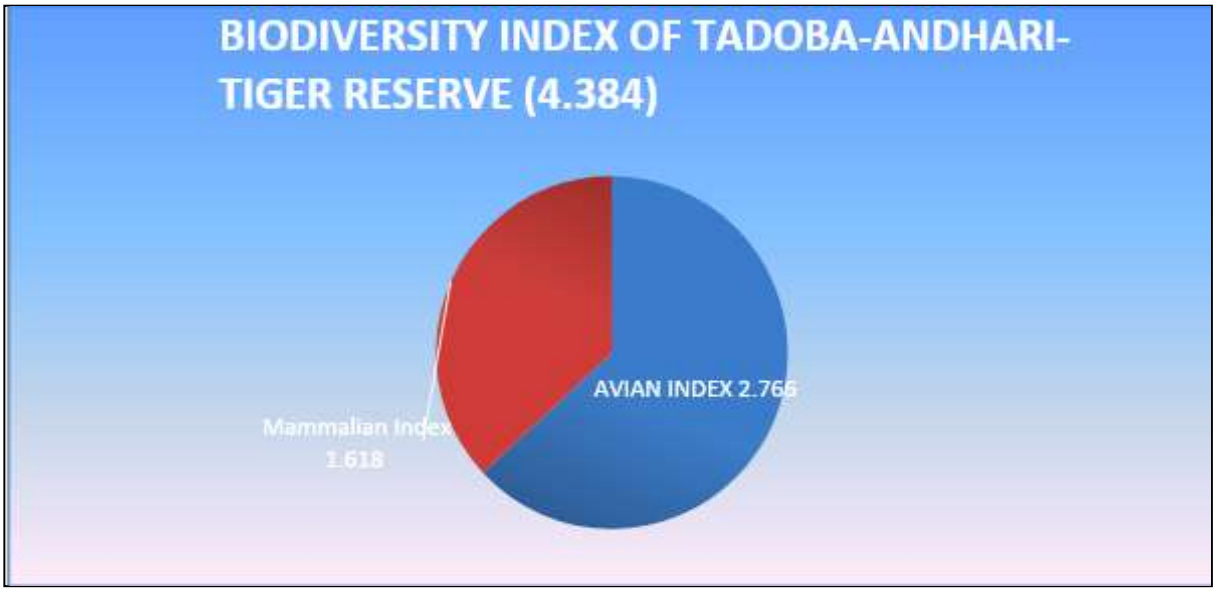
Green bee eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufous treepie	4	0.018	-3.452	-0.109
Rose ringed parrot	3	0.013	-4.299	-0.058
Great coucal	3	0.013	-4.299	-0.058
Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002
Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002
House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thickknee bird	2	0.009	-4.705	-0.042

Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013
Purple heron	3	0.013	-4.299	-0.058
Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109
Serpent eagle	3	0.013	-4.299	-0.058
Yellow headed fish eagle	1	0.004	-5.398	-0.002
Yellow footed	5	0.023	-3.788	-0.085

green pegion				
Indian long tailed shrink	1	0.004	-5.398	-0.002

Summed Biodiversity Index:

Ha=(+2.766)



Faunal Diversity - Tadoba

Mammalian Fauna

Sloth Bear (*Melursus ursinus*)

Sambar deer *(Rusa unicolor)*

Bison

Tiger (*Panthera tigris*)

Avian Fauna

Fork-tailed Drongo(*Dicrurus adsimilis)*

Indian Roller (*Coracias benghalensis*)

Peacock (*Pavo cristatus*)

Black headed ibis

Quadrate Study

Principal: When an ecologist wants to know how many organisms there in a particular habitat , it would not be feasible to count them all . Instead , he or she would be forced to count a small representative part of the population , called a sample . Sampling of plants or animals that do not move much (such as nails) , can be done using a sampling square called a quadrat . A suitable size of a quadrat depends on the size of the organisms being sampled . For

example , to count plants growing on a school field , one could use a quadrat with sides 0.5 or 1 meter in length.

Setting for Quadrate

Materials & methods of Insect Collection:

-Materials Used

1.Small Garden Shovels

2.Forceps

3.A kill jar containing 70% alcohol

4.Insect pins

5.Zipback packers & plastic containers

6.Labels

7.String

8.Iron poles

9.Magnifying glass

10.Newspaper for collection

Methodology:

A suitable site was selected for the quadrate work to be done. An area of 1sq m was measured and the region was demarcated with the help of a string . The string was fixed in a square form of 1mX1m and

the corners were fixed with iron poles . Thus the quadrat was formed and various species of flora and fauna were collected with the help of forceps.

Bush beating

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

Requirements:

Umbrella
Stick/Staff
70% Ethyl Alcohol
Air-tight Containers
Sterile Gloves
Tape

Methodology

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

Bush beating

Pitfall

Pitfall-traps: For Soil-surface-active Invertebrates

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capture more specific types of insects.

Requirements

- While carrying out Pitfall Trapping

1. Containers
2. Soap water
3. 70% Ethyl Alcohol
4. Forceps
5. Sterile Gloves
6. Sugar

Methodology

For the Pitfall traps, four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.
- Soap water was poured into the containers to make the surface slippery
- and thereby ensuring the avoidance of escape attempts by the captured insect.
- The pitfall trap was allowed to remain intact for about 6 hours. The collected insects were then poured into containers with 70% ethyl alcohol.
- Ethyl Alcohol was used as a preservative for the soft bodied animals as it maintained their elemental composition.

Setting of Pitfall Trap

Pitfall Trap

Specimens found

TADOBA

TIGER AS A KEYSTONE SPECIES

Ø A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist all together. A keystone species is often, but not always, a predator.

Ø Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex predator can regulate species abundance, distribution, diversity; which in turn can impact the health of terrestrial habitats.

Ø Additionally they provide essential food sources for the grazers and remove the sick and weak from the population of prey species.

Ø The decimation of these important tiger species can have cascading effects throughout the ecosystems they inhabit, resulting in economically and ecologically devastating consequences.

Ø In India Kanha National Park, the keystone species is Tiger and the "jewel" has been described as Barasingha.

Ø Tiger is the largest of the world's great cats. Barhasinha, gaur, sambar, chital, nilgai help to maintain wildlife population.

1. **Pug marking:**

Pugmark is the term used to refer to the footprint of most animals (especially mega fauna). "Pug" means foot in Hindi (Sanskrit 'padh'; Greek 'ped'). Every individual animal species has a distinct pugmark and as such this is used for identification.

Importance of Pugmark:

A. Wildlife conservationists are known to catalogue pugmarks in the areas they operate.

B. Pugmarks are also used for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries etc.

C. It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.

To make a plaster cast:

Ø Materials:

I. Plaster of Paris(medical quality).

II. Water.

III. A mug to prepare paste.

IV. A strip of thick paper or flexible aluminum.

ACKNOWLEDGEMENT

We would like to extend our gratitude to our respected Principal Dr.Arpita Mukherji,our respected vice Principal,Dr.Supratim Das,our Head of the department Dr. Narayan Chandra Das,our accompanying professor Dr. Swagata Chattopadhyay and Mr. Sunil Pramanik,alongside to all the professors in our department,who have all helped us all along,immensely.We are highly indebted to them for such an enriching experience that the college heads have solely arranged

for the betterment of quality of learning for the students.It has been a marvellous opportunity to observe and learn amidst the inherent wonders of nature. This excursion has helped all of the classmates to work better as a team and we could all broaden our horizons in terms of ecological survey.

Date of submission : 15/03/2021

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UNIVERSITY OF CALCUTTA

EXCURSION TO TADOBA –ANDHARI TIGER RESERVE

SEMESTER - 5 (CBCS).

SUBJECT- ZOOA.

CC- 11 .

NAME:-SAYANI ACHERJEE

COLLEGE ROLL NO.:-18S-736

CU ROLL NO.- 183223 -11- 0103.

CU REGN. NO.- 223 -1211- 0389 -18.

Introduction:-

Aim of the experiment

The purpose of zoological excursion is to provide and inculcate within us deep taste about the subject of zoology, and especially about animal behaviours along with the practical demonstration of certain topic learnt in theory.While the purpose to carry out excursion is quintessentially “learning”,it can also be joyous and loaded with fun and a experience that will reiterate in our inward eye for a long period of time!!!Moreover,it is needless to mention that without sheer practical knowledge the study if bio-science as whole remains incomplete.It provides a platform where we can closely observe wildlife and their “distinct” behaviour, straightaway from their own natural habitat.

Therefore,wildlife excursion gives us a closer glance at our diversed flora and fauna that our nation is enriched with.

Importance of maintaining a field notebook

A good field notebook,serves many potential such as listed below:-

The field notebook forms the main record of the data you gather in the field. In particular, it should contain notes on where the data were collected, the relationships between the different rock bodies, their compositional and textural characteristics, and internal features.

It usually also records the location of any samples collected, the position and orientation of any photographs taken, cross yureferences to published information and notes on any ideas that you have for interpretation or questions raised by your observations.

In addition the field notebook usually links together any other components that you might have used to record data and ideas in the field. For instance, an electronic database held on a piece of geophysical equipment, field maps, annotated figures and graphic logging sheets.

Your notebook should be kept as neat and well organised as possible. The location of the section being examined should be given precisely, preferably with a grid reference and possibly a sketch map too, so you can find it again.

Biodiversity is the key of diversity

What is biodiversity?

The variety of life on Earth, its biological diversity is commonly referred to as biodiversity.

The number of species of plants, animals, and microorganisms, the enormous diversity of genes in these species, the different ecosystems on the planet, such as deserts, rainforests and coral reefs are all part of a biologically diverse Earth.

Appropriate conservation and sustainable development strategies attempt to recognize this as being integral to any approach to preserving biodiversity. Almost all cultures have their roots in our biological diversity in some way or form.

Why is biodiversity so essential?

Biodiversity boosts ecosystem productivity where each species, no matter how small, all have an **important role** to play.

For example,

- A larger number of plant species means a greater variety of crops

- Greater species diversity ensures natural sustainability for all life forms
- Healthy ecosystems can better withstand and recover from a variety of disasters.

And so, while we dominate this planet, we still need to preserve the diversity in wildlife.

Types of Biodiversity:

Genetic Diversity:

- Different genes and combinations of genes within populations
- Allows population of a species to adopt to environmental changes

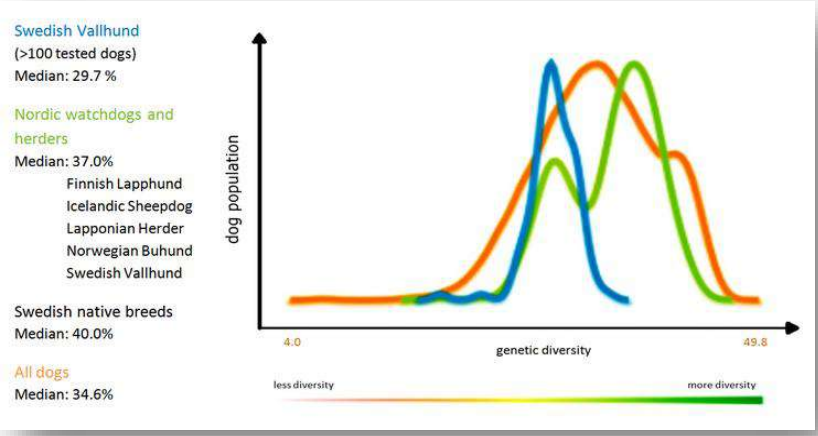


Fig: Genetic Diversity of Swedish Vallhund compared to other breeds.

Species Diversity:

- Different kinds of organism, relationships among species
- Refers to the number of kinds of species being found

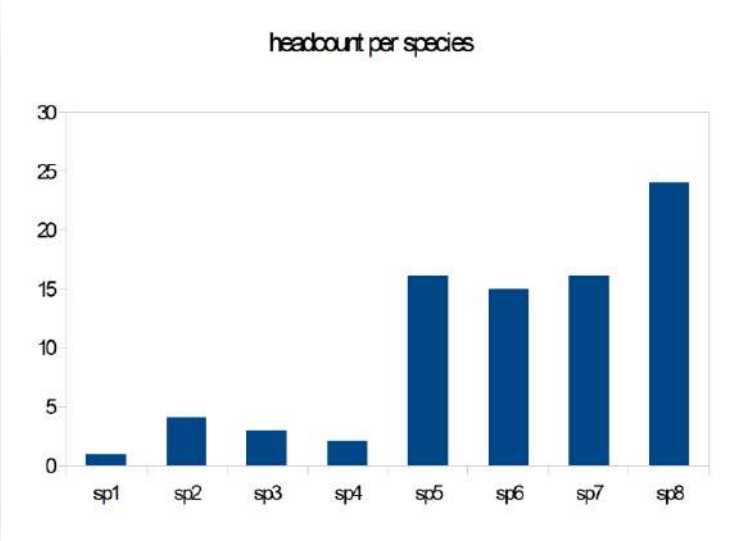


Fig: Fluctuations in species number.

Ecological Diversity:

- Different habitats, niches, species interactions

  -An assemblage of species living in the same area and interacting with an environment

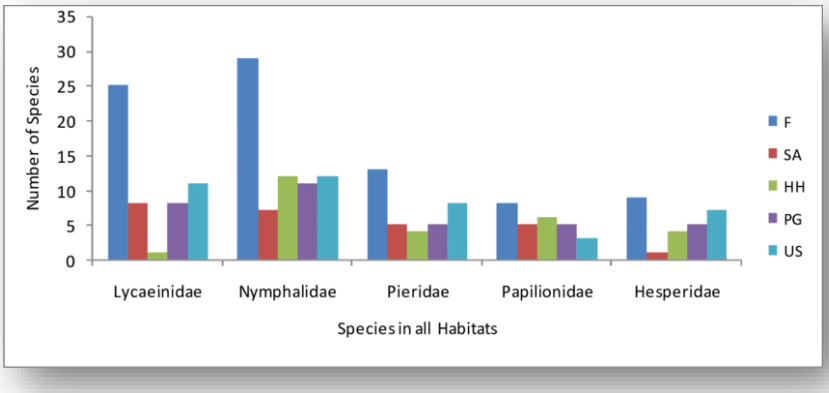


Fig: Species diversity in various Habitats.

EXCURSION DIARY:

>ITIENERY:

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE:

Date of Journey	:-	23rd February 2020
Train No & Name	:-	12860 Gitanjali Express
Departure Time & Place	:-	13:40hrs Howrah Station
Reporting Time & Place	:-	12:00hrs at Howrah Station New Complex in front of Mail and Express Inquiry

DETAILS OF TOUR PROGRAMME

23/02/20:- Start from **Howrah Station** at 13:40 by **12860 Gitanjali** for **Nagpur Station.**

24/02/20:- Reaching **Nagpur Station** at 07:20hrs. Start from **Nagpur Station** at 08:00hrs by Bus for **Tadoba National Park.** Reaching **Tadoba** at 12.00hrs and transfer at Forest **Rest House and Dormitory**.
Afternoon and Evening : Biodiversity specimen collection studies. Night stay at **Tadoba**.

25/02/20:- Morning and Afternoon coverage **Tadoba National Park Safari (Junona and Agarjhari Zone)** by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at **Tadoba.**

26/02/20:- Start from **Tadoba** at 08.00hrs by Bus for **Bor.** Reaching **Bor** at 12.00hrs and transfer at **Forest Rest House** and **Dormitories.**
Afternoon and Evening : Biodiversity specimen collection studies.
Night stay at **Bor.**

27/02/20:- Morning and Evening coverage **Bor National Park Safari (Bordharan)** by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at **Bor at Maharastra Tourism Accomodation.**

28/02/20:- Start from **Bor** at 06.00hrs by Bus for **Nagpur Station.** Reaching **Nagpur Station** at 09.00hrs. Start from **Nagpur Station** at 10.10hrs by **12129 Azad Hind Express** for **Howrah Station.**

29/02/20:- Reaching **Howrah Station** at 04.15hrs.

>ACCOMPANYING PERSONS:

- Prof. Swagata Chattopadhyay.
- Sri Sunil Kr. Pramanik

FIG: MAP OF MADHYA PRADESH SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

FIG: MAP OF TADOBA-ANDHARI TIGER

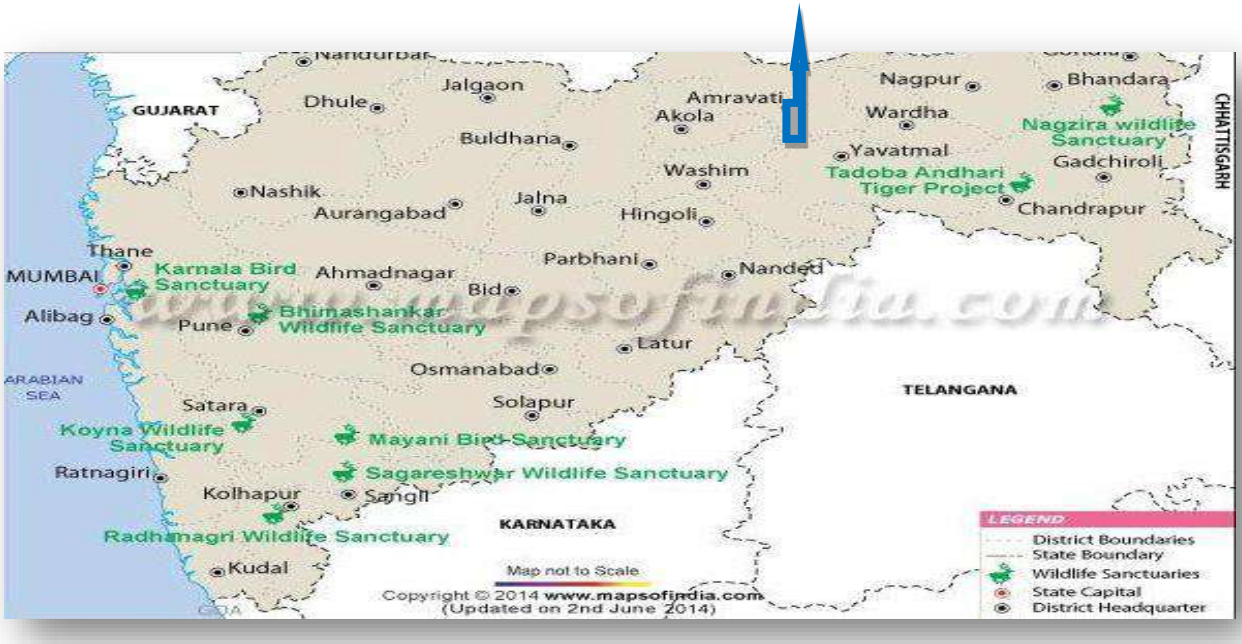


FIG: MAP OF MAHARASTRA SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

GROUP PHOTO

TADOBA-ANDHARI TIGER RESERVE

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

Location

Coordinates: 20◦10′N 79◦24′E

Total area covered by Tadoba National Park is 116.55 sq.kms.

It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.

The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the Tadoba National Park, created in the year 1955.

History

Legend holds that Taru was a village chief who was killed in a mythological encounter with a tiger. A shrine dedicated to the God Taru now exists beneath a large tree, on the banks of Tadoba Lake. The temple is frequented by adivasis, especially during a fair held annually in the Hindu month of Pausha, between December and January.

The Gond kings once ruled these forests in the vicinity of the Chimur hills. Hunting was completely banned in 1935. Two decades later, in 1955, 116.54 square kilometres (45.00 sq mi) was declared a national park. Andhari Wildlife Sanctuary was created in the adjacent forests in 1986, and in 1995 both the park and the sanctuary were merged to establish the present tiger reserve.

The Andhari Wildlife Sanctuary was formed in the year 1986 and was amalgamated with the park in 1995 to establish the present Tadoba Andhari Tiger Reserve.

Significance

Tadoba National park contains some of the best of forest tracks and endowed with rich biodiversity. It is famous for its natural heritage.

Tadoba is an infinite treasure trove of innumerable species of trees and plants - and wildlife that includes Tigers, Panthers, Sloth Bears, Hyenas, Jackals, Wild Dogs, Bison, Barking Deer, Nil Gai, Sambar, and Cheatal.

Known for its rich biodiversity, the Tadoba National Park is nothing less than a paradise for wildlife enthusiasts. Owing to the presence of the big cats, the park was announced as the 41st Tiger Reserve of India. Along with the tigers, the park provides a home to the Wild Boar, Leopard, Spotted Deer, Rusty Spotted Cat, Indian Mouse Deer, Sambar, Gaur, Sloth Beer, Four Horned Antelope, Flying Squirrel and so on.

Etymology

The word 'Tadoba' is derived from the name of God "Tadoba" or "Taru," which is praised by local tribal people of this region and "Andhari" is derived from the name of Andhari river that flows in this area

Type of Forest

Tadoba reserve is a predominantly southern tropical dry deciduous forest

Physical Factors:-

Temperature:

Winters are cold with average temperature from 9 to 25 degree celcius.

Summers are dry and temperature is between 30 to 45 degrees celcius.

Rainfall:

Tadoba experiences a humid monsoon with rainfall upto 50 inch.

Topography

Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges. Densely forested hills form Northern and Western boundary of this area. Elevation of these hills ranges from 200mts to 350mts

Tadoba lake acts as the buffer between the forest and the extensive farmland which extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

Geography

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smooth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and caves provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari ranges. The south part of the park is less hilly than the remainder.

Flora Found:-

Bamboo	Bambusa sp.
Ain	Terminalia elliptica
Bija	Pterocarpus marsupium
Haldu	Haldina cordifolia
Salai	Boswellia serrata
Semal	Bombax ceiba
Shisham	Dalbergia sissoo
Bel	Aegle marmelos
Mahua	Madhuca longifolia
Palas	Butea monsperma
Hirda	Terminalia chebula
Tendu	Diospyros melanoxylon
Kusum	Schleichera oleosa
Dhawada	Anogeissus latifolia
Karya gum	Sterculia urens

Fauna found:- Tadoba-Andheri National Park.

Sambar-Tadoba TR

Leopard in Tadoba TR

Tiger chasing a wild pig

Sloth bear in Tadoba TR

Tigress Maya with her cubs

Tigress Madhuri.

As of August 2016, there are 88 tigers in the reserve, and 58 in the forests immediately outside the reserve.[5]
Aside from the keystone species, the Bengal tiger, Tadoba Tiger Reserve is home to other mammals, including: Indian leopards,[6] sloth bears, gaur, nilgai, dhole, striped hyena, small Indian civet, jungle cats, sambar, barking deer, chital, chausingha and honey badger. Tadoba lake sustains the marsh crocodile, which was once common all over Maharashtra.
Reptiles here include the endangered Indian python and the common Indian monitor. Terrapins, Indian star tortoise, Indian cobra and Russel's viper also live in Tadoba.
The lake contains a wide variety of water birds, and raptors. 195 species of birds have been recorded, including three endangered species. The grey-headed fish eagle, the crested serpent eagle, and the changeable hawk-eagle are some of the raptors seen in the park.

Indian Paradise Flycatcher - Female - Tadoba Andhari Tiger Reserve, Chandrapur, Maharashtra, female guarding its nest weaved on a bamboo twig.

Other bird species found in the reserve include the orange-headed thrush, Indian pitta, crested treeswift, stone curlew, crested honey buzzard, paradise flycatcher, bronze-winged jacana, lesser goldenbacked woodpecker, various warblers, black-naped blue flycatcher and the Indian peafowl.

Peafowl in Tadoba

74 species of butterflies have been recorded including pansies, monarchs, mormons and swordtails.
Insect species include the endangered danaid egg-fly and great eggfly. Dragonflies, stick insects, jewel beetles and the praying mantis are other insects in the reserve.
The signature spider, giant wood spider and red wood spiders are often seen during the monsoon and soon after. Some hunting spiders like the wolf spiders, crab spiders and lynx spiders are also common.[7]
A black panther was spotted in May 2018. As per the officials, it is a rare sight since black panthers normally live in evergreen forests and not in dry deciduous forests like Tadoba Tiger Reserve.[8]

Safari Zones in Tadoba

The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:

Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

Entry Gates for Safari in Tadoba

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear,

hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai, etc. The movement of tourists inside the park is not restricted like in other reserves, therefore one can completely enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

1. Moharli Gate: Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.
2. Kuswanda: The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.
3. Kolara Gate: This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.
4. Navegaon Gate: The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.
5. Pangdi Gate: The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.

6. Zari Gate: Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

Jeep Safari in Tadoba National Park

The Jeep Safari is the best thing that one can experience in Tadoba National Park. The open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting a tiger and other wild animals are relatively high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more.

The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where the jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives respectively. A park guide has to accompany the jeep for security purpose. Also, the tourists can enter the park by presenting their personal information and

identification papers at the gate and the foreigners by showing their passport in original.

The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

Safari Timing in Tadoba

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Moharli (Mohurli) Zone, Tadoba Zone, and Kolsa Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period	Morning		Afternoon	
	Entry	Exit	Entry	Exit
1st Oct to 30th Nov	6 AM - 8 AM	10:00 AM	2.30 PM – 4 PM	6.30 PM
1st Dec to 28th / 29th Feb	6.30 AM - 8.30 AM	11:00 AM	2 PM – 3.30 PM	6:00 PM

1st Mar to 30th April	5.30 AM – 7.30 AM	10:00 AM	3 PM – 4.30 PM	6.30 PM
1st May – 30thJune	5 AM – 7 AM	9.30 AM	3.30 PM – 5 PM	7:00 PM

Location of Tadoba Tiger Reserve on map

Location of the accommodation during our trip

To Reach Tadoba National Park

By Air

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities.

Best Time to Visit Tadoba

March to May is the best time to see tiger as summer temperatures are extremely high especially

in the month of May. The monsoon begins from June to September and Vegetation and insect life come alive with the arrival of monsoon in mid June. The post monsoon starts from

October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

Climate and Weather of Tadoba National Park

Winters stretch from November to February and day temperatures is between 25°-30°C and the park is looks green. Summers are too hot in Tadoba as the temperature increases to 47°C; even so it is the ideal time to sight mammals near water lakes as the vegetation is also rare, increasing visibility. The monsoon breaks in June with heavy rainfall of approx.1275 mm. and humidity is around 66%.

Safari Census

We completed a total of 2 safaris in 1 Protected Area, namely, Tadoba-Andhari Tiger Reserve.

We went on all the safaris on Gypsies.

Tadoba-Andhari Tiger Reserve Census:

- Junona zone(Morning Safari) &
- Agarzari Zone (Afternoon Safari)

Avian Fauna

Species	*Scientific Name*	Count
1.	*Dicrurus macrocercus*	6
2. Parakeet	*Psittacula cyanocephala*	4
3. Black headed ibis	*Threskiornis melanocephalus*	7
4. Lesser egret	*Egretta garzetta*	14
5. Lesser whistling duck	*Dendrocygnajavanica*	17
6. Jacana	*Metopidius indicus*	3
7. White eyed buzzard	*Butastur teesa*	2
8. Indian magpie Robin	*Turdus migratorius*	2
9. Common Kingfisher	*Haleyon smyrnesis*	3
10. Blue kingfisher	*Alcedo atthis*	1
11. Peafowl and peahen	*Pavo cristatus*	14
12. Asian Open -billed stork	*Anastomous oscitans*	9
13. Green Bee eater	*Merops orientalis*	2
14. Red vented bulbul	*Pycnonotus cafer*	6
15. Indian roller	*Coracias benghalensis*	5
16. Rufous treepie	*Dendrocitta vagabunda*	4
17. Rose-ringed parrot	*Psittacula krameri*	3
18. Green junglefowl	*Gallus varius*	12
19. Great Cormorant	*halacrocoracidae aristoteli*	11

20. Indian Pond Heron	*Ardeola grayii*	3
21. Purple Heron	*Ardea purpurea*	3
22. Grey Heron	*Ardea cinerea*	6
Species	***Scientific name***	**Count**
23. Jungle owl	*Glaucidium radiatum*	1
24. Serpent Eagle	*Spilornis cheela*	3
25. Jungle Babbler	*Turdoides striata*	16
26. Grey headed Fish eagle	*Ichthyophaga ichthyaetus*	1
27. Cuckoo	*Cocomantis flabelliformis*	2
28. Yellow Footed Green Pigeon	*Treron phoenicoptera*	5
29. Spotted dove	*Spilopelia chinensis*	6
30. Common starling	*Sturnus vulgaris*	3
31. Grey hornbill	*Buceros bicornis*	2
32. Purple moorhen	*Porphyrio porphyrio*	15
33. Red wattled lapwing	*Vanellus indicus*	4
34. Koel	*Eudynamys scolopaceus*	3
35. Golden oriole	*Oriolus kundoo*	1
36. Black hooded oriole	*Oriolus xanthornus*	2
37. Spotted-billed duck	*Anus poecilorhyncga*	3
38. Indian Long tailed shrike	*Lanius schach*	1
39. Greater Coucal	*Centropus sinesis*	3
40. Common Tailorbird	*Orthotomus sutorius*	4
41. Woodpecker	*Picidae sp.*	1
42. Eurasian Thick -knee bird	*Burhinus oedicnemus*	2
43. Red spurfowl	*Galloperdix spadicea*	1
44. Little Grebe	*Tachybaptis ruficollis*	1
45. Glossy Ibis	*Plegadis falcinellus*	1
46. Osprey	*Pandion haliaetus*	1
47. House sparrow	*Passer domesticus*	1
48. Shikra	*Accipiter badius*	1

TOTAL OBSERVED:		221

Mammalian Fauna

Species	*Scientific Name*	Count
1.Spotted deer	*Axis axis*	28
2.Langur	*Semnopithecus entellus*	18
3.Sambar	*Rusa unicolor*	15
4.Barking deer	*Muntiacus muntjak*	2
5. Indian Gaur	*Bos gaurus*	3
6.Dhole	*Cuon alpines*	4
7.Sloth bear	*Melursus ursinus*	3
8.Jackal	*Canis aureous*	1
9.Wild boar	*Sus scrofa*	4
10. Blue bull (nilgai)	*Boselaphus tragocamelus*	2
11.Tiger	*Panthera tigris*	1
12.Tiger cubs	*Panthera tigris*	3
TOTAL OBSERVED		84

Mammalian diversity

Name	Count	pi	ln(pi)	Pi*ln(pi)
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gour	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053

Avian diversity

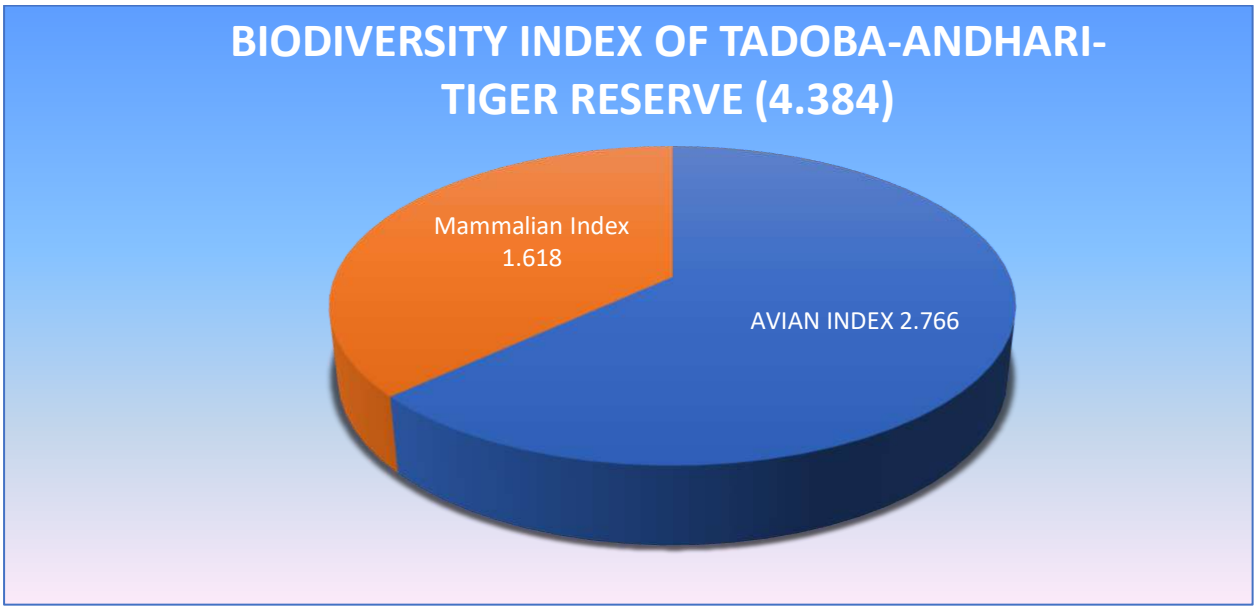
Name	Count	pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190
Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042
Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098
Koyel	3	0.013	-4.299	-0.058
Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149

Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073
Bulbul	6	0.027	-3.606	-0.098
White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042
Spotted billed duck	3	0.013	-4.299	-0.058
Green bee eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufous treepie	4	0.018	-3.452	-0.109
Rose ringed parrot	3	0.013	-4.299	-0.058
Great coucal	3	0.013	-4.299	-0.058
Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002

Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002
House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thickknee bird	2	0.009	-4.705	-0.042
Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013
Purple heron	3	0.013	-4.299	-0.058
Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109
Serpent eagle	3	0.013	-4.299	-0.058
Yellow headed fish eagle	1	0.004	-5.398	-0.002

Yellow footed green pegion	5	0.023	-3.788	-0.085
Indian long tailed shrink	1	0.004	-5.398	-0.002

PIE-CHART OF AVIAN AND MAMMALIAN COUNTS:



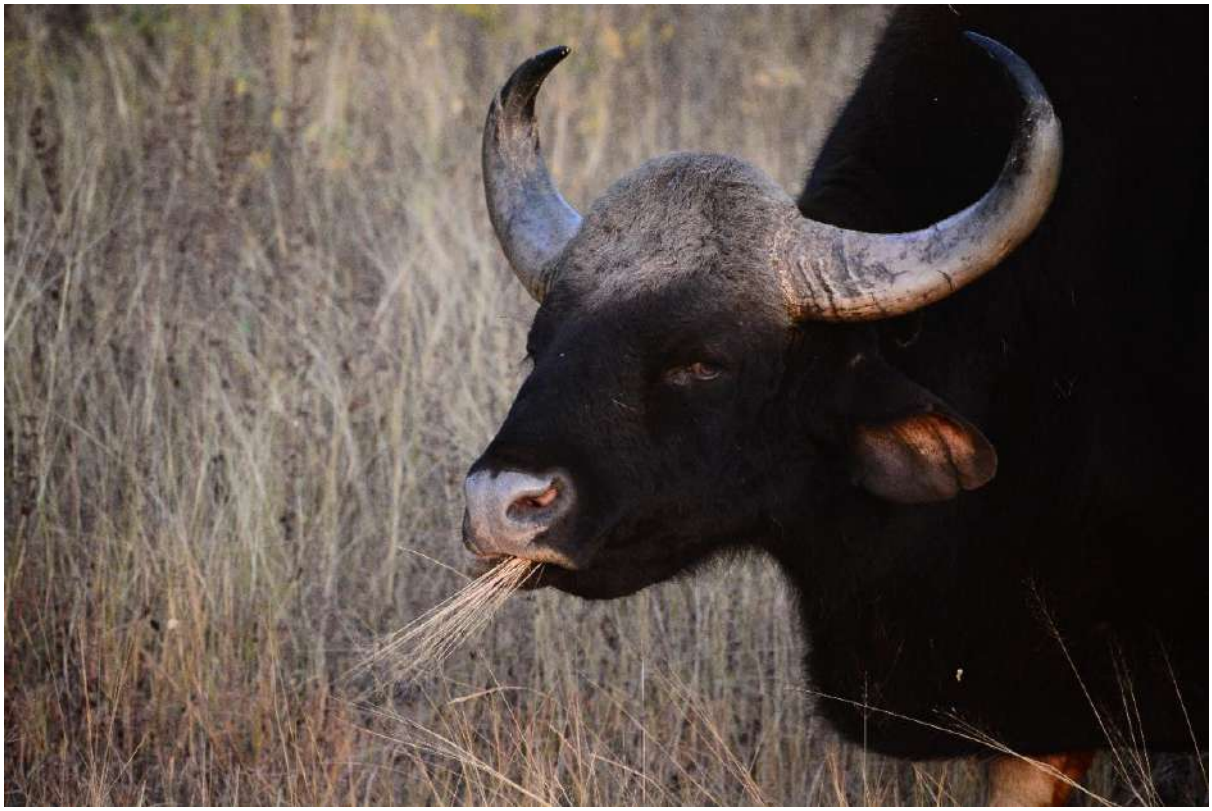
Faunal Diversity - Tadoba

Mammalian Fauna

Axis axis (Spotted Dear)

Rusa unicolor (Sambar)

Semnopithecus entellus (Gray Langur)



Bos gaurus (Indian Bison)

Herpestes edwardsi (Mongoose)

Melursus ursinus (Sloth Bear)

Sus scrofa (Wild Boar)

Cuon alpines (Wild Dog)

Avian Fauna

Dricrurs macrocercus (Black Drongo)

Merops orientalis (Green Bee Eater)

Coracias benghalensis (Indian Roller)

Turdoides striata (Jungle Babbler)

Geokichla citrina (Orange-headed Thrush)

Psittacula cyanocephala (Plum-headed Parakeet, Female)

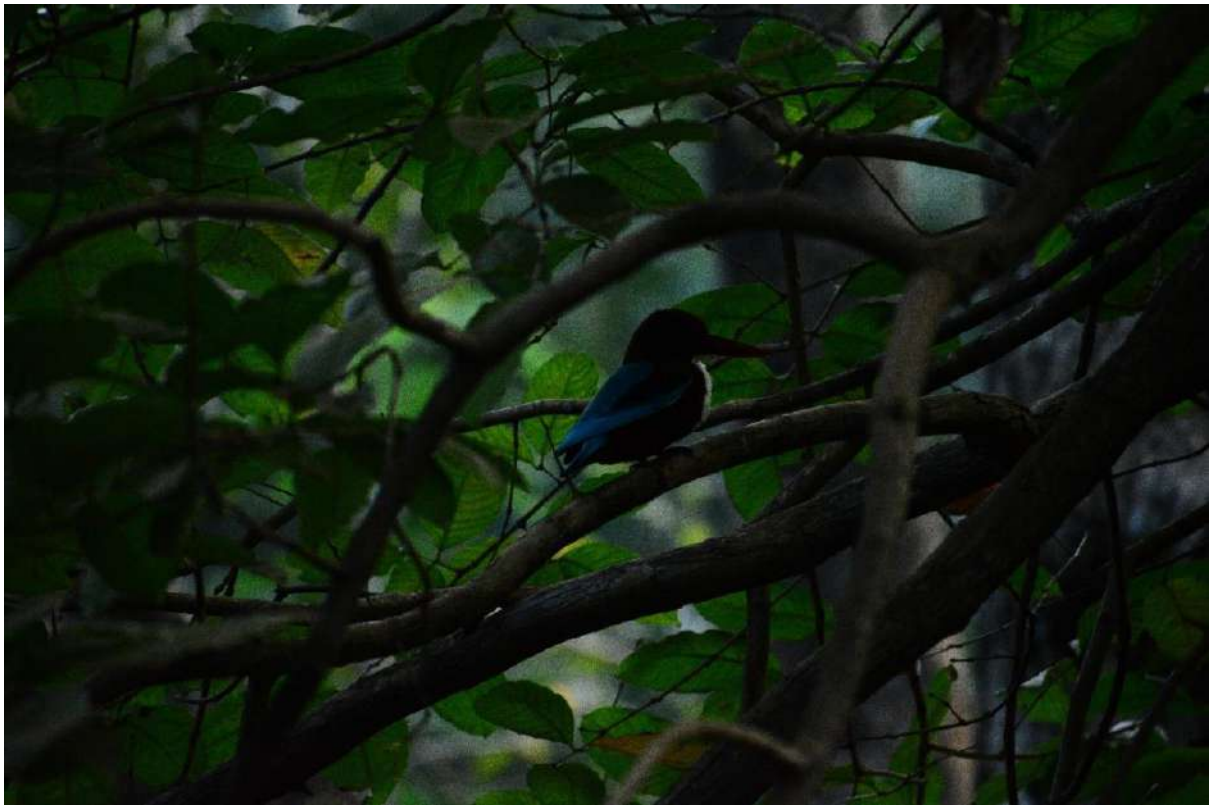
Pavo cristatus (Peafowl, Male)

Pseudibis papillosa (Red-headed Ibis)

Pycnonotus cafer (Red Vented Bulbul)

Spilornis cheela davisoni (Crested Serpent Eagle)

Phalacrocoracidae aristotelis (Cormorant)



Halcyon smyrnensis (White-breasted Kingfisher)

Bush beating

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

Requirements:

1. Umbrella
2. Stick/Staff
3. 70% Ethyl Alcohol
4. Air-tight Containers
5. Sterile Gloves
6. Tape

Methodology

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

Pitfall

Pitfall-traps: For Soil-surface-active Invertebrates

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capture more specific types of insects.

Requirements

- While carrying out Pitfall Trapping

    1. Containers
    2. Soap water
    3. 70% Ethyl Alcohol
    4. Forceps
    5. Sterile Gloves
    6. Sugar

Methodology

For the Pitfall traps, four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.
- Soap water was poured into the containers to make the surface slippery and thereby ensuring the avoidance of escape attempts by the captured insect.
- The pitfall trap was allowed to remain intact for about 6 hours. The collected insects were then poured into containers with 70% ethyl alcohol.
- Ethyl Alcohol was used as a preservative for the soft bodied animals as it maintained their elemental composition.

Species found are:-

Study of Quadrat

Principle:- when an ecologist wants to know how many organizations there are in an particular habitat, it would not be feasible to count them all. Instead he would be forced to count a smaller representative part of the population called sample. Sampling of plants & animals that don't move much(such as snails) can be done by using sampling square called quadrat. A suitable size of quadrat depends upon size of the organisms being sampled. For example to count plants growing on college campus one could use a quadrat with size 0.5to 1 meter in length.

Materials & methods of insects collection

1. Small garden gloves
2. Forceps
3. A kill jar containing 70% alchol
4. Insect pins
5. Ziploc packets & plastic container
6. Labels
7. Strings
8. Wood poles
9. Magnifying glass
10. Newspaper for collection

Methodology

A suitable site was selected for quadrat work to be done. An area of 1sq was measured & the region was demarcated with the help of string. The string was fixed in square form 1meter*1meter & the corners were fixed with wood poles. Thus the quadrat was formed & various species of flora & fauna were collected with the help of forceps.

1. Pug Marking :

Pug marking is the term used to refer to the footprint of most animals (specially mega fauna). “Pug” means foot in Hindi (Sanskrit –*Padh*; Greek –*Ped*. Every individual animal species has a different pugmark and as such it is used for identification.

IMPORTANCE OF PUGMARK:

- ✓ Wildlife conservationists are known to catalogue pugmarks in the areas they operate.
- ✓ Pugmarks are also for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries, etc.
- ✓ It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.

❖ TO MAKE A PLASTER CAST

➢ MATERIALS:

- Plaster of Paris (medical quality)
- Water
- A mug to prepare paste
- A strip of thick paper or flexible aluminium.

Tiger as a keystone species

- A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether. A keystone species is often, but not always, a predator.

- Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex species can regulate species abundance, diversity, distribution; which in turn can impact the health of terrestrial habitats.

- Additionally they provide essential food sources for the grazers and remove the sick and weak from population of prey species.

- The decimation of these tiger species can have cascading effects throughout the ecosystem they inhabit, resulting in economically and ecologically devastating consequences.

- In India's Kanha National Park, the keystone species is Tiger and the jewel has been described as "barasinha".

- Tiger is the largest of the world's great cats. Barasinha, gaur, sambar, chital, nilgai help to maintain wildlife population.

Acknowledgement

We,feel a sense of rare achievement in bringing out this field notebook.This field notebook would not have seen the light of the day,if our respected teachers had not felt the vacuum of a comprehensive idea on the subject of Zoology.

We,would fervently like to express our thanks to our Principal ma'am,**Dr. Arpita Mukerji ma'am and our Vice Principal Sir, Dr.Supratim Ghosh** for giving us this opportunity for excursion.We, also extend our deepest regards to our **hOD,Dr.Narayan Chandra Das sir.**We extend our profound gratitude towards our respected professor who accompanied us to our excursion **Professor Swagata Chattopadhyay ma'am** and,also support staff Sri Sunil Kr. Pramanik. We are thankful to our entire Zoology dept. of Scottish Church College, Kolkata-**Dr.A Chatterjee,Dr.P.Pal,Dr.S Bhattacharjee, Proffessor M.Kundu** and all those who are associated with our department. I,also send my deepest thanks to my **entire batch** for their support and co-operation without those this excursion won’t have become an wonderful piece of memory that'll be cherished forever.

183223-11-0103

223-1211-0389-18

Date:-14/03/2021.

UNIVERSITY OF CALCUTTA

EXCURSION TO TADOBA –ANDHARI TIGER RESERVE

NAME- SHRADDHA BHAKTA

SEMESTER – 5 (CBCS).

SUBJECT- ZOOA.

CC - 11 .

COLLEGE ROLL NO. – 18S-729.

C.U. ROLL NO.- 183223 -11- 0112.

CU REGN. NO.- 223 -1211- 0446 -18.

INDEX:

INTRODUCTION

AIM OF EXCURSION:

An Educational Tour or A Field Trip is a visit to a place away from their normal place of study..The **aim** of this research is to :

- **Observe the subject in its natural state and possibly collect samples**.

The purpose of this trip is to:

- Usually ***o*bservation for education**, non-experimental research or to provide students with **experiences outside their everyday activities**,
- **Provide students an experience outside the class rooms or labs.**
- **It also provides an opportunity non experimental research and helps bring all the students to a common platform irrespective of their social, economic & cultural background.**

SOME BENEFITS OF AN EXCURSION:

- While on an educational tour/field trip a student gets to experience first-hand the concepts which help in **long term retention of the knowledge**.
- If the class room teaching is followed up by a field trip, it helps in clearing the concepts & results in **more effective learning**.
- It also **helps in application of ideas, theories & knowledge which ensure competence**. Discussing during the trip help the students to find solutions to real life problems and makes them innovative. Field trips helps reduce the pressure the boredom & monotony of having to attend a lecture. It is fun way of learning & makes it more enjoyable.
- While on an educational tour/field trip students have the opportunity to have lively discussion in an informal set up.
- Educational Tour/Field Trips also provide an opportunity to students to evolve and be on their own which helps make them **independent Interactions with people outside helps improve communication skills and makes them more accommodating. The educational tour/field trip helps in developing overall personality of students.**

- It is an opportunity **to inculcate the habit of travelling alone & in groups and making them more empathetic towards fellow students.**
- By such excursion students become interested in the exploration of their environment.
- It helps in developing cooperative **attitude and various others.**
- It **motivates the students for self-study and self-activity**. It helps in the **development of creative faculties of the students.**
- It helps in **development of power of observations ,exploration, judgement and drawing inferences ,problem solving ability of students.**
- It helps in **developing qualities of resourcefulness, self-confidence, initiative, leadership amongst students.**
- Educational Tours & Field Trips provide **an opportunity of experiential learning to students** of all streams.

PURPOSE OF FIELD NOTES:

Field notes refer to qualitative notes recorded by scientists or researchers or students in the course of field research, during or after their observation of a specific organism or phenomenon they are studying.

- ✓ The notes are intended to be read as evidence that gives meaning and aids in the understanding of the phenomenon.
- ✓ Field notes allow the researcher to access the subject and record what they observe in an unobtrusive manner.
- ✓ Field notes are particularly valued in descriptive sciences such as ethnography, biology, ecology, geology, and archaeology, each of which have long traditions in this area.
- ✓ Writing in such a detailed manner may contribute to the personal development of a student.

BIODIVERSITY:

Biodiversity refers to the variety and variability of life on Earth. Biodiversity typically measures variation at the genetic, species, and ecosystem level. Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.

Biodiversity is not distributed evenly on Earth, and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversity is usually highest along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans.

There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

Types of Biodiversity:

Genetic Diversity:

- Different genes and combinations of genes within populations.
- Allows population of a species to adopt to environmental changes.

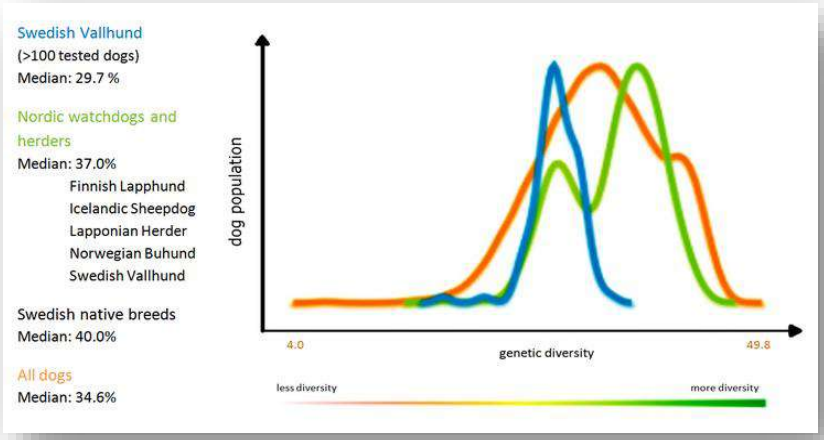


Fig: Genetic Diversity of Swedish Vallhund compared to other breeds.

Species Diversity:

- Different kinds of organism, relationships among species.
- Refers to the number of kinds of species being found.

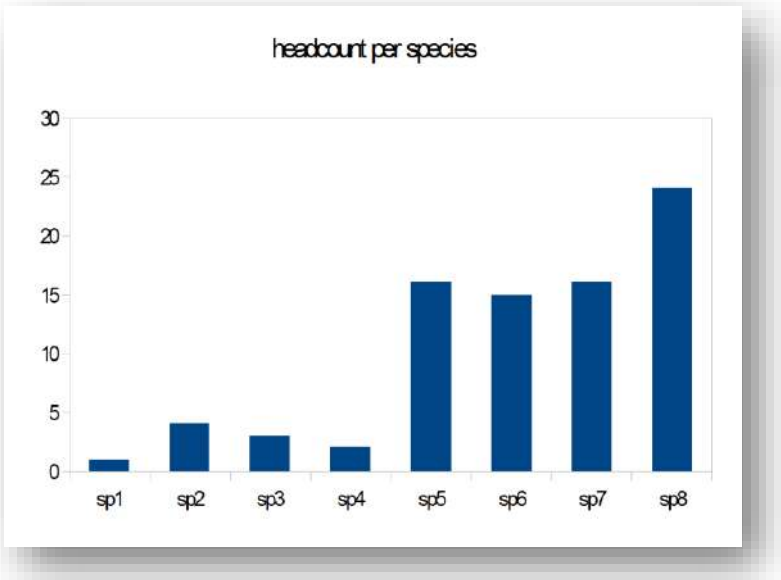


Fig: Fluctuations in species number.

Ecological Diversity:

- Different habitats, niches, species interactions

  -An assemblage of species living in the same area and interacting with an environment

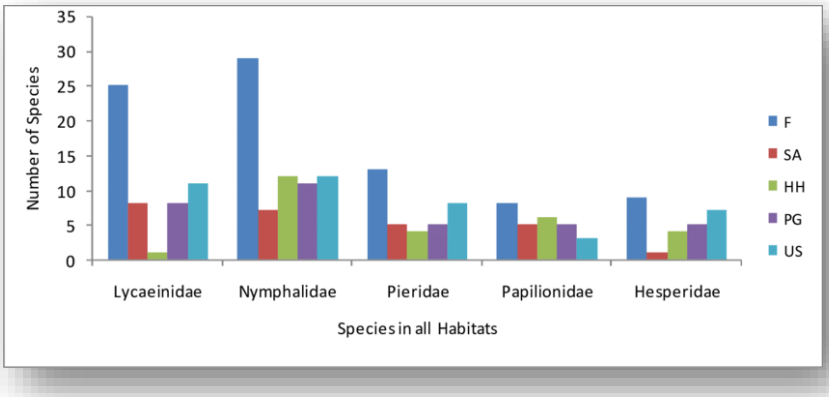


Fig: Species diversity in various Habitats.

EXCURSION DIARY:

>ITIENERY:

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE:

Date of Journey :- 23rd February 2020
Train No & Name :- 12860 Gitanjali Express
Departure Time & Place :- 13:40hrs Howrah Station
Reporting Time & Place :- 12:00hrs at Howrah Station New Complex in front of Mail and Express Inquiry

DETAILS of TOUR PROGRAMME

23/02/20:- Start from Howrah Station at 13:40 by 12860 Gitanjali for Nagpur Station.

24/02/20:- Reaching Nagpur Station at 07:20hrs. Start from Nagpur Station at 08:00hrs by Bus for Tadoba National Park. Reaching Tadoba at 12.00hrs and transfer at Forest Rest House and Dormitory.
Afternoon and Evening : Biodiversity specimen collection studies. Night stay at Tadoba.

25/02/20:- Morning and Afternoon coverage Tadoba National Park Safari (Junona and Agarjhari Zone) by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at Tadoba.

26/02/20:- Start from Tadoba at 08.00hrs by Bus for Bor. Reaching Bor at 12.00hrs and transfer at Forest Rest House and Dormitories.
Afternoon and Evening : Biodiversity specimen collection studies.
Night stay at Bor.

27/02/20:- Morning and Evening coverage Bor National Park Safari (Bordharan) by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at Bor.

28/02/20:- Start from Bor at 06.00hrs by Bus for Nagpur Station .Reaching Nagpur Station at 09.00hrs. Start from Nagpur Station at 10.10hrs by 12129 Azad Hind Express for Howrah Station.

29/02/20:- Reaching Howrah Station at 04.15hrs.

>ACCOMPANYING PERSONS:

- Prof. Swagata Chattopadhyay. - Sri Sunil Kr. Pramanik.

Maps of National Parks and Sanctuaries of Maharastra, Madhya Pradesh & TATR:

FIG: MAP OF MADHYA PRADESH SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

FIG: MAP OF TADOBA-ANDHARI TIGER RESERVE.

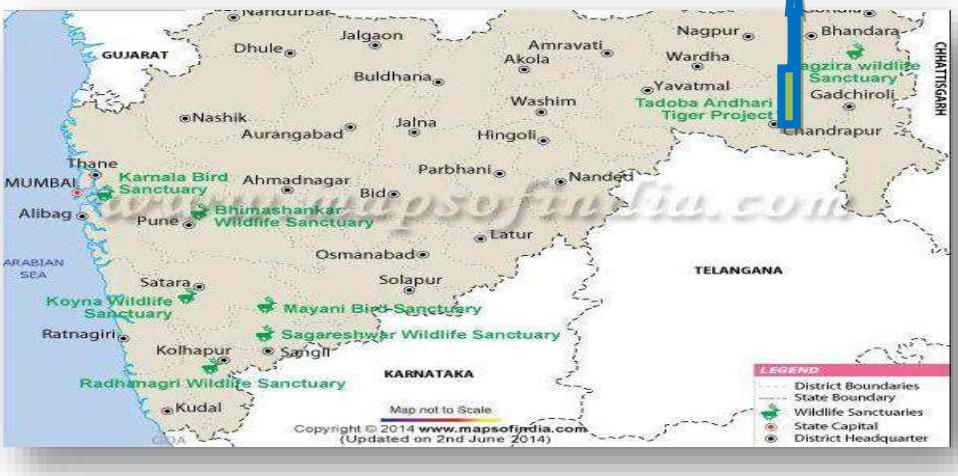


FIG: MAP OF MAHARASTRA SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

TADOBA-ANDHARI TIGER RESERVE

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

- **Location:**

Coordinates: 20◦10′N 79◦24′E

Total area covered by Tadoba National Parkis 116.55 sq.kms.

It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.

The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the Tadoba National Park, created in the year 1955.

- **History:**

Legend holds that Taru was a village chief who was killed in a mythological encounter with a tiger. A shrine dedicated to the God Taru now exists beneath a large tree, on the banks of Tadoba Lake. The temple is frequented by adivasis, especially during a fair held annually in the Hindu month of Pausha, between December and January.

The Gond kings once ruled these forests in the vicinity of the Chimur hills. Hunting was completely banned in 1935. Two decades later, in 1955, 116.54 square kilometres (45.00 sq mi) was declared a national park. Andhari Wildlife Sanctuary was created in the adjacent forests in 1986, and in 1995 both the park and the sanctuary were merged to establish the present tiger reserve.

The Andhari Wildlife Sanctuary was formed in the year 1986 and was amalgamated with the park in 1995 to establish the present Tadoba Andhari Tiger Reserve.

- **Significance:**

Tadoba National park contains some of the best of forest tracks and endowed with rich biodiversity. It is famous for its natural heritage. Tadoba is an infinite treasure trove of

innumerable species of trees and plants - and wildlife that includes Tigers, Panthers, Sloth Bears, Hyenas, Jackals, Wild Dogs, Bison, Barking Deer, Nil Gai, Sambar, and Cheatal. Known for its rich biodiversity, the Tadoba National Park is nothing less than a paradise for wildlife enthusiasts. Owing to the presence of the big cats, the park was announced as the 41st Tiger Reserve of India. Along with the tigers, the park provides a home to the Wild Boar, Leopard, Spotted Deer, Rusty Spotted Cat, Indian Mouse Deer, Sambar, Gaur, Sloth Beer, Four Horned Antelope, Flying Squirrel and so on.

- ## Etymology:

The word 'Tadoba' is derived from the name of God "Tadoba" or "Taru," which is praised by local tribal people of this region and "Andhari" is derived from the name of Andhari river that flows in this area.

- ## Type of Forest:

Tadoba reserve is a predominantly **southern tropical dry deciduous forest.**

- ## Physical Factors;

Temperature:

Winters are cold with average temperature from 9 to 25 degreecelcius.
Summers are dry and temperature is between 30 to 45 degrees celcius.

Rainfall:

Tadoba experiences a humid monsoon with rainfall upto 50 inch.

- ## Topography:

Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges. Densely forested hills form Northern and Western boundary of this area. Elevation of these hills ranges from 200mts to 350mts.
Tadoba lake acts as the buffer between the forest and the extensive farmland which extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

- **Geography:**

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smooth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and caves provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari ranges. The south part of the park is less hilly than the remainder.

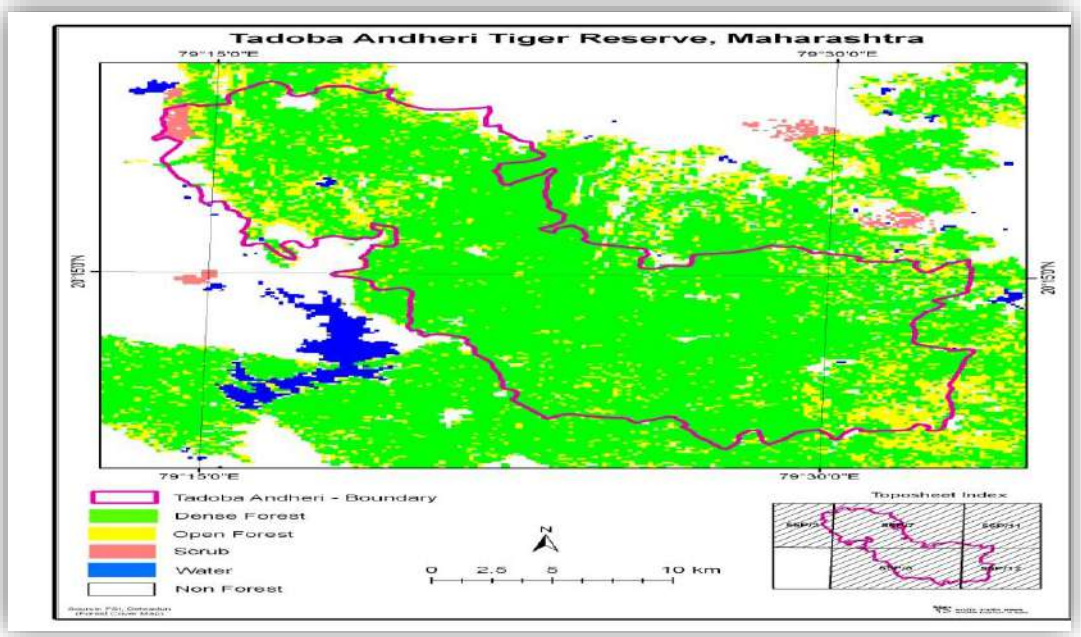


Fig: Map of Tadoba – Andhari Tiger Reserve with latitude and longitude.

Safari Zones in Tadoba:

The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:

Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

Entry Gates for Safari in Tadoba:

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai, etc. The movement of tourists inside the park is not restricted like in other reserves, therefore one can completely enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

1. **Moharli Gate**: Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.
2. **Kuswanda:** The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.

3. **Kolara Gate:** This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.
4. **Navegaon Gate:** The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.
5. **Pangdi Gate:** The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.
6. **Zari Gate:** Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

Jeep Safari in Tadoba National Park:

The Jeep Safari is the best thing that one can experience in Tadoba National Park. The open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting a tiger and other wild animals are relatively high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more. The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where the jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives respectively. A park guide has to accompany the jeep for security purpose. Also, the tourists can enter the park by presenting their personal information and identification papers at the gate and the foreigners by showing their passport in original.

The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

Safari Timing in Tadoba:

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Moharli (Mohurli) Zone, Tadoba Zone, and Kolsa Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period	Morning		Afternoon	
	Entry	Exit	Entry	Exit
1st Oct to 30th Nov	6 AM - 8 AM	10:00 AM	2.30 PM – 4 PM	6.30 PM
1st Dec to 28th / 29th Feb	6.30 AM - 8.30 AM	11:00 AM	2 PM – 3.30 PM	6:00 PM
1st Mar to 30th April	5.30 AM – 7.30 AM	10:00 AM	3 PM – 4.30 PM	6.30 PM
1st May – 30thJune	5 AM – 7 AM	9.30 AM	3.30 PM – 5 PM	7:00 PM

Group Photo at Tadoba –Andhari Tiger Reserve (Agarzari zone) .

To Reach Tadoba National Park:

By Air

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities.

Best Time to Visit Tadoba:

March to May is the best time to see tiger as summer temperatures are extremely high especially in the month of May. The monsoon begins from June to September and Vegetation and insect life come alive with the arrival of monsoon in mid June. The post monsoon starts from October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

Group photo at Tadoba-Andhari Tiger Reserve.

Abiotic Components

Abiotic components or abiotic factors are non-living chemical and physical parts of the environment that affect living organisms and the functioning of ecosystems. Abiotic components include physical conditions and non-living resources that affect living organisms in terms of growth,maintenance, and reproduction. All non-living components of an ecosystem, such as the atmosphere or water, are called abiotic components.

Abiotic variables found in terrestrial ecosystems can include things like rain, wind, temperature, altitude, soil, pollution, nutrients, pH, types of soil, and sunlight.

Determination of pH:

Requirements:-

- pH meter.

Method:-

The electrode of the calibrated pH meter was dipped in the sample and the reading was noted and recorded.

Observed pH of soil:

Place of recording of data	Date of Recording	pH of Soil
1. Tadoba-Andhari Tiger Reserve	26.02.2020	7.3

Determination of Temperature:

Requirements:-

- Laboratory Thermometer.

Method:-

The thermometer was hung in the open and kept undisturbed/dipped in the water and the temperature was recorded.

The **observed temperatures of the air** are tabulated below:

Place of recording of data	Date of Recording	Time ofrecording	Temperature of Air
1.Tadoba-Andhari Tiger Reserve	26.02.2020	6:45 am 8:45am	17.5°C 23°C

BIODIVERSITY- the key of diversity:

Biodiversity is the root of all living system. The earth is home to a rich and diverse array of living organism. The biodiversity is the natural biological capital of earth and presents opportunity to all.

India has a rich varied heritage of biodiversity, consisting of a wide spectrum of habitats. Biodiversity is indeed the bedrock of all bioindustrial development in the unusually large rural sector of our country. It is of enormous importance for human welfare.

Biodiversity is the soul of man and it renders him a healthy environment because it maintains nature's balance very effectively at any cost.

Indian flora is more varied than any other country of area. India's rich vegetational wealth and diversity is undoubtedly due to the immense variety of climatic and altitudinal variations coupled with rich ecological habitats. India is one of the topmost megadiversity nations, enriched by about 45,000 plants and about 50,000 species of animals amounting the world's **5%** biodiversity.

Flora:

Bamboo (*Bambusa sp.*)

Ain (*Terminalia elliptica)*

Karya gum (*Sterculiaurens)*

Bija (*Pterocarpus marsupium)*

Haldu (*Haldinacordifolia)*

Salai (*Boswellia serrata)*

Semal (*Bombax ceiba*)

Shisham (*Dalbergia sissoo)*

Bel (*Aegle marmelos)*

Mahua (*Madhucalongifolia)*

Palas (*Butea monsperma)*

Hirda (*Terminalia chebula)*

Tendu (*Diospyros melanoxylon)*

Kusum(*Schleicheraoleosa)*

Dhawada (*Anogeissuslatifolia)*

Safari Census

We completed a total of 2 safaris in 1 Protected Area, namely, Tadoba-Andhari Tiger Reserve.

We went on all the safaris on Gypsies.

Tadoba-Andhari Tiger Reserve Census:

- **Junona zone(Morning Safari) &**
- **Agarzari Zone (Afternoon Safari).**

Avian Fauna

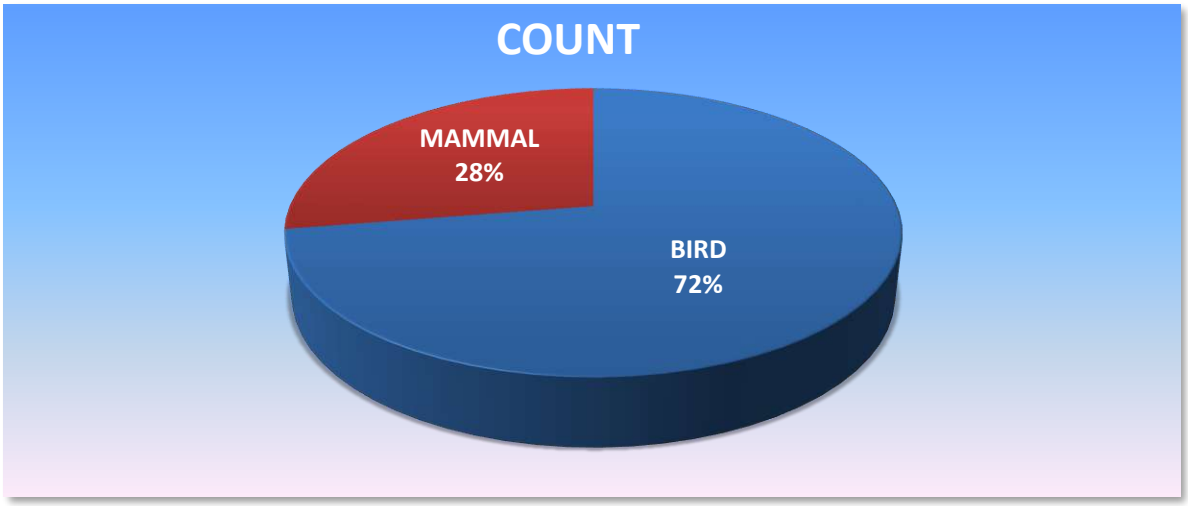
Species	*Scientific Name*	Count
1. Black Drongo	*Dicrurus macrocercus*	6
2. Parakeet	*Psittacula cyanocephala*	4
3. Black headed ibis	*Threskiornis melanocephalus*	7
4. Lesser egret	*Egretta garzetta*	14
5. Lesser whistling duck	*Dendrocygnajavanica*	17
6. Jacana	*Metopidius indicus*	3
7. White eyed buzzard	*Butastur teesa*	2
8. Indian magpie Robin	*Turdus migratorius*	2
9. Common Kingfisher	*Haleyon smyrnesis*	3
10. Blue kingfisher	*Alcedo atthis*	1
11. Peafowl and peahen	*Pavo cristatus*	14
12. Asian Open -billed stork	*Anastomous oscitans*	9
13. Green Bee eater	*Merops orientalis*	2
14. Red vented bulbul	*Pycnonotus cafer*	6
15. Indian roller	*Coracias benghalensis*	5
16. Rufous treepie	*Dendrocitta vagabunda*	4
17. Rose-ringed parrot	*Psittacula krameri*	3
18. Green junglefowl	*Gallus varius*	12
19. Great Cormorant	*Phalacrocoracidae aristotelis*	11
20. Indian Pond Heron	*Ardeola grayii*	3
21. Purple Heron	*Ardea purpurea*	3
22. Grey Heron	*Ardea cinerea*	6

Species	***Scientific name***	**Count**
23. Jungle owl	*Glaucidium radiatum*	1
24. Serpent Eagle	*Spilornis cheela*	3
25. Jungle Babbler	*Turdoides striata*	16
26. Grey headed Fish eagle	*Ichthyophaga ichthyaetus*	1
27. Cuckoo	*Cocomantis flabelliformis*	2
28. Yellow Footed Green Pigeon	*Treron phoenicoptera*	5
29. Spotted dove	*Spilopelia chinensis*	6
30. Common starling	*Sturnus vulgaris*	3
31. Grey hornbill	*Buceros bicornis*	2
32. Purple moorhen	*Porphyrio porphyrio*	15
33. Red wattled lapwing	*Vanellus indicus*	4
34. Koyel	*Eudynamys scolopaceus*	3
35. Golden oriole	*Oriolus kundoo*	1
36. Black hooded oriole	*Oriolus xanthornus*	2
37. Spotted-billed duck	*Anus poecilorhyncga*	3
38. Indian Long tailed shrike	*Lanius schach*	1
39. Greater Coucal	*Centropus sinesis*	3
40. Common Tailorbird	*Orthotomus sutorius*	4
41. Woodpecker	*Picidae sp.*	1
42. Eurasian Thick -knee bird	*Burhinus oedicnemus*	2
43. Red spurfowl	*Galloperdix spadicea*	1
44. Little Grebe	*Tachybaptis ruficollis*	1
45. Glossy Ibis	*Plegadis falcinellus*	1
46. Osprey	*Pandion haliaetus*	1
47. House sparrow	*Passer domesticus*	1
48. Shikra	*Accipiter badius*	1
TOTAL OBSERVED:		**221**

Mammalian Fauna

Species	*Scientific Name*	Count
1.Spotted deer	*Axis axis*	28
2.Langur	*Semnopithecus entellus*	18
3.Sambar	*Rusa unicolor*	15
4.Barking deer	*Muntiacus muntjak*	2
5. Indian Gaur	*Bos gaurus*	3
6.Dhole	*Cuon alpines*	4
7.Sloth bear	*Melursus ursinus*	3
8.Jackal	*Canis aureous*	1
9.Wild boar	*Sus scrofa*	4
10. Blue bull (nilgai)	*Boselaphus tragocamelus*	2
11.Tiger	*Panthera tigris*	1
12.Tiger cubs	*Panthera tigris*	3
TOTAL OBSERVED		**84**

- **PIE-CHART OF AVIAN AND MAMMALIAN FAUNA COUNTS:**



BIODIVERSITY INDEX

Quantifying the species diversity of ecological communities is complicated. In addition to issues of statistical sampling, the rather arbitrary nature of delineating an ecological community, and the difficulty of positively identifying all of the species present, species diversity itself has two separate components:

>> the number of species present (*species richness*), and

>> their relative abundances (termed *dominance* or *evenness*).

Diversity indicex- This is the measure of the number of species in an area and the relative distribution of individuals among those species. One such diversity index is:

Shannon-Wiener Diversity Index:

The idea behind this index is that the diversity of a community is similar to the amount of information in a code or message. It is calculated in the following way:

$$H' = -\sum\{p_i \times \ln(p_i)\}$$

Where, pi is the proportion of individuals found in species i. For a well-sampled community, we can estimate this proportion as

$$pi = ni/N,$$

where,ni is the number of individuals in species i and N is the total number of individuals in the community.

Since by definition the pis' will all be between zero and one, the natural log makes all of the terms of the summation negative, which is why wetake the inverse of the sum.

The Shannon-Weiner index being a measure of uncertainty,thus measures the diversity of a particular biogeographical region.

Interpretations of the mathematical data provide an insight into the biodiversity distribution of the fauna and hence are reflected by the species richness of the forests under study.

As a part of our endeavours to study the statistical aspect and interpretations of biodiversity, the Shannon-Weiner index of Tadoba-Andhari Tiger Reserve was calculated:

Avian biodiversity Index :

Name	Count	pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190
Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042
Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098
Koyel	3	0.013	-4.299	-0.058
Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149
Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073
Name	**Count**	**pi**	**ln(pi)**	**pi*ln(pi)**
Bulbul	6	0.027	-3.606	-0.098

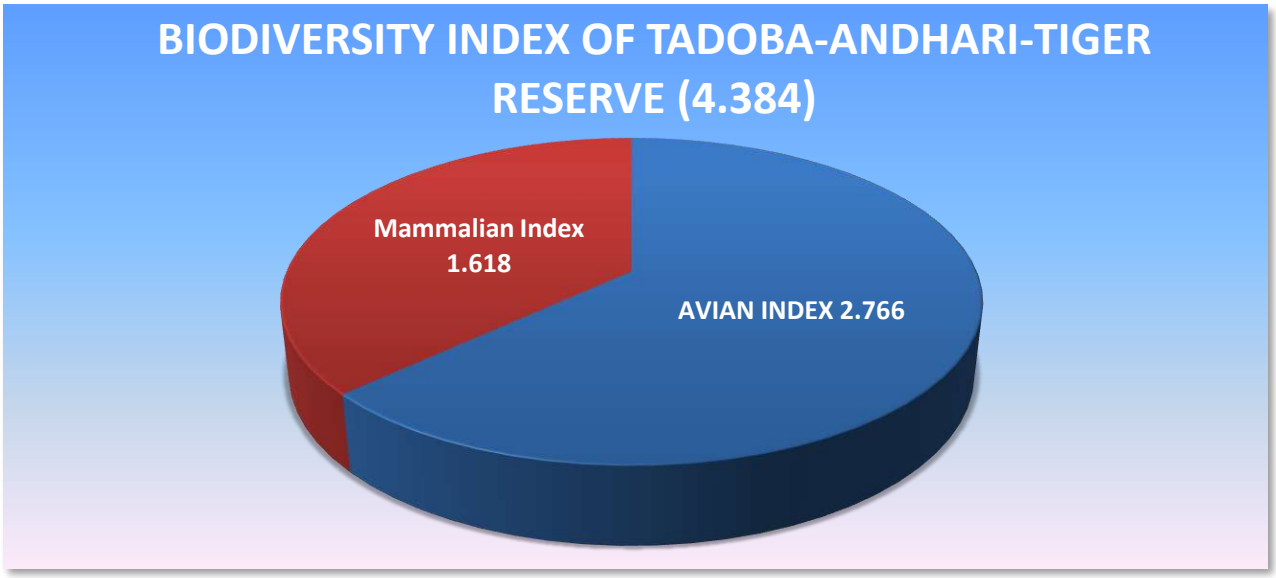
White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042
Spotted billed duck	3	0.013	-4.299	-0.058
Green bee-eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufous treepie	4	0.018	-3.452	-0.109
Rose- ringed parrot	3	0.013	-4.299	-0.058
Greater coucal	3	0.013	-4.299	-0.058
Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002
Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002
House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thick-knee bird	2	0.009	-4.705	-0.042
Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013
Purple heron	3	0.013	-4.299	-0.058
Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109
Serpent eagle	3	0.013	-4.299	-0.058
Yellow headed fish eagle	1	0.004	-5.398	-0.002
Yellow footed green pegion	5	0.023	-3.788	-0.085
Indian long tailed shrike	1	0.004	-5.398	-0.002
Summed Biodiversity Index (Ha)				**2.766**

Mammalian diversity Index:

Name	Count	pi	In(pi)	Pi*ln(pi)
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gaur	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053
Summed Biodiversity Index(Hm)				**1.618**

Biodiversity Index of Tadoba-Andhari Tiger Reserve:

Hm+Ha = 2.766+1.618 =4.384



FAUNAL DIVERSITY: AVIAN DIVERSITY:

Rose-ringed Parrot (*Psittacula krameri)*

Yellow-footed Green Pegion *(Treron phoenicoptera)*

Indian Roller*(Coracias benghalensis)*

Indian long-tailed Shrike(*Lanius schach)*

Black Drongo (*Dicrurus macrocercus)*

Indian Pond Heron (Ardeola grayii)

Peafowl (*Pavo cristatus)*

Black-headed Ibis (*Threskiornis melanocephalus)*

Crested-Serpent Eagle (*Spilornis cheela)*

-: MAMMALIAN FAUNA :-

Tigress Madhuri (*Panthera tigris*)

Sloth Bear (*Melursus ursinus)*

Pug mark of Sloth Bear

Sambar Deer(*Rusa unicolor)*

Langur (*Semnopithecus entellus)*

Spotted Deer (*Axis axis*)

Wild Boar (*Sus scrofa)*

Indian Gaur *(Bos gaurus)*

PITFALL

Pitfall-traps: For Soil-surface-active Invertebrates.

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capture more specific types of insects.

Requirements:

- While carrying out Pitfall Trapping

1. Containers
2. Soap water
3. 70% Ethyl Alcohol
4. Forceps
5. Sterile Gloves
6. Sugar

Methodology:

For the Pitfall traps,four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.
- Soap water was poured into the containers to make the surface slippery and thereby ensuring the avoidance of escape attempts by the captured insect.
- The pitfall trap was allowed to remain intact for about 6 hours. The collected insects were then poured into containers with 70% ethyl alcohol.
- Ethyl Alcohol was used as a preservative for the soft bodied animals as it maintained their elemental composition.

Students collecting samples from Pitfall trap.

Pitfall trap.

Students preparing Pitfall Trap.

BUSH-BEATING

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

Requirements:

1. Umbrella.
2. Stick/Staff.
3. 70% Ethyl Alcohol.
4. Air-tight Containers.
5. Sterile Gloves.
6. Tape.

Methodology:

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

Students performing Bush-beating.

Students performing bush beating and collecting samples.

Students collecting samples after Bush-beating.

QUADRAT-STUDY

Principle:- When an ecologist wants to know how many organizations there are in an particular habitat, it would not be feasible to count them all. Instead he would be forced to count a smaller representative part of the population called sample. Sampling of plants & animals that don't move much(such as snails) can be done by using sampling square called quadrat. A suitable size of quadrate depends upon size of the organisms being sampled. For example to count plants growing on college campus one could use a quadrat with size 0.5to 1 meter in length.

Materials & methods of insects collection :

1. Small garden gloves.
2. Forceps.
3. A kill jar containing 70% alcohol.
4. Insect pins.
5. Ziploc packets & plastic container.
6. Labels.
7. Strings.
8. Wood poles.
9. Magnifying glass.
10. Newspaper for collection .

Methodology:

A suitable site was selected for quadrat work to be done. An area of 1sq was measured & the region was demarcated with the help of string. The string was fixed in square form 1meter*1meter & the corners were fixed with wood poles. Thus the quadrat was formed & various species of flora & fauna were collected with the help of forceps.

Students preparing for Quadrat study.

Students preparing for Quadrat study.

FEW INSECT SAMPLEs COLLECTED FROM PITFALL, BUSH-BEATING, QUADRAT STUDY:

Phylum- Arthropoda

Phylum- Arthropoda

Phylum- Arthropoda

Phylum- Arthropoda

Phylum- Arthropoda

PUG-MARKING

Pug marking is the term used to refer to the footprint of most animals (specially mega fauna). "Pug" means foot in Hindi (Sanskrit –*Padh*; Greek – *Ped*. Every individual animal species has a different pugmark and as such it is used for identification.

IMPORTANCE OF PUGMARK:

- ✓ **Wildlife conservationists are known to catalogue pugmarks in the areas they operate.**
- ✓ **Pugmarks are also for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries, etc.**
- ✓ **It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.**

❖ TO MAKE A PLASTER CAST

➢ MATERIALS:

- **Plaster of Paris (medical quality)**
- **Water**
- **A mug to prepare paste**
- **A strip of thick paper or flexible aluminium.**

Pug mark of Tiger at Tadoba-Andhari Tiger Reserve(Junona Zone).

TIGER AS A KEYSTONE SPECIES

- A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether. A keystone species is often, but not always, a predator.

- Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex species can regulate species abundance, diversity, distribution; which in turn can impact the health of terrestrial habitats.

- Additionally they provide essential food sources for the grazers and remove the sick and weak from population of prey species.

- The decimation of these tiger species can have cascading effects throughout the ecosystem they inhabit, resulting in economically and ecologically devastating consequences.

- In India's Kanha National Park, the keystone species is Tiger and the jewel has been described as "barasinha".

- Tiger is the largest of the world's great cats. Barasinha, gaur, sambar, chital, nilgai help to maintain wildlife population.

Tigress Madhuri at Tadoba-Andhari Tiger Reserve (Junona Zone).

ACKNOWLEDGEMENT:

I would like to express my heartfelt thanks and gratitude to the Principal of Scottish Church College, Dr. Arpita Mukerji, Vice- Principal, Dr. Supratim Das , HOD of Zoology Dept. Dr. Narayan Chandra Das and to our respected professors of Zoology Department , Prof. Swagata Chattopadhyay, Dr. Samrat Bhattacharya, Dr. Partha Pal, Dr. Aniruddha Chatterjee, Dr. Malini Kundu, who gave us this golden opportunity to accomplish this project , which not only enriched us with a lot of knowledge but also gave us handful of practical experiences .

Secondly, l would also like to thank all my classmates who helped me a lot for successfully completing the field report amidst a deadly pandemic and within a limited time frame . Without everyone's active cooperation I would have never been able to finish this Field Report of our memorable Excursion to Tadoba-Andhari Tiger Reserve.

Date: 14.03.2021.

UNIVERSITY OF CALCUTTA

CU ROLL NO. : 183223-11-0109

CU REG NO. : 223-1211-0440-18

SEMESTER : 5

SUBJECT : ZOOA

PAPER : CC11 (EXCURSION FIELD REPORT ON BIODIVERSITY)

DATE OF SUBMISSION : 15/03/2021

SHREYA WILLIAM

COLLGE ROLL NO.: 18S-702

EXCURSION FIELD REPORT ON BIODIVERSITY

INTRODUCTION

AIM OF EXCURSION

The purpose of zoological excursion is to gain a much deeper knowledge about the topics related to the subject such as wildlife,nature and environment with the help of practical demonstration along with theoretical facts.While their purpose is essentially to educate,they can also be fun bonding experience for everyone involved. Moreover without practical knowledge,the study of bio-science is incomplete. It also provides scope to study wildlife and observe animals and their behaviours in their natural habitat.
Hence zoological excursions help us to come in close contact with the flora and fauna of various places with different climatic conditions and atmospheric variations and in better understanding of the relation between flora and fauna.

IMPORTANCE OF EXCURSION NOTEBOOK

An outstanding field notebook serves many potential purposes
1.It is a valuable record of what you have seen,heard,discussed and thought about in the field.
2.It may contain the data which will lead to an oral presentation,and/or a thesis.
3.It may be a graded portion of a curve.
4.It may be something you and your relatives will find interesting decades in the future.

FIELD DATA COLLECTION PURPOSE OF FIELD NOTES:

- MONEY: Field books contain data which has been collected over weeks or months.The cost of collecting the data can range in the thousand of dollars.
- LITIGATION:Property surveys are subject to court review.The status of the field book can be a very important factor in litigation.

- EFFICIENCY:The information in the field book is used by office personnel to make drawings or calculations.Complete and correct notes are essential.

BASIC REQUIREMENTS FOR GOOD NOTES

>ACCURACY:By far the most important aspect of field notes.
>INTEGRITY:(complete) if the field crew fails to collect all important data,costly delays can occur in the office.
>ARRANGEMENT:Following a standard note format,save time and money when trying to follow notes.
>LEGIBILITY:Major errors can occur if your notes cant be read easily.
>CLARITY:well planned surveys with clear special notations and sketches will great add to the understanding of the survey.

BIODIVERSITY IS THE KEY OF DIVERSITY

Biodiversity is the most commonly used to replace the more clearly defined and long established terms,species diversity and species richness. Biologists most often define biodiversity as the "Totality of genes,species,and ecosystem of a region".Biodiversity is the degree of variation of life. This can refer to genetic variation,or ecosystem variation within an area,biome,or planet. Terrestrial biodiversity tends to be the highest at low latitude near the equator,which seems to be the result of the warm climate and high primary productivity.

Marine biodiversity tends to be highest along coasts in the Western Pacific,when sea surface temperature is highest and in-latitudinal band in all oceans.Biodiversity generally tends to cluster in hotspots,and has been increasing through time but will be likely to slow in the future. Rapid environmental changes typically cause mass extinctions.

One estimate is that <1%-3% of that species that have existed on earth are extant. The period since the emergence of humans has displayed ongoing biodiversity reduction and an accompanying loss of genetic diversity. Named the Holocene extinction,the reduction is caused primarily by human impacts,particularly habitat destruction.

Conversely,biodiversity impacts human health in a number of ways,both positively and negatively.

The Limited Nations designated 2011-2020 as the Limited Nations Decade on Biodiversity.

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE

Date of Journey **:-** **23rd February 2020**

Train No & Name **:-** **12860 Gitanjali Express**

Departure Time & Place **:-** **13:40hrs Howrah Station**

Reporting Time & Place and Express Inquiry **:-** **12:00hrs at Howrah Station New Complex in front of Mail**

DETAILS of TOUR PROGRAMME

23/02/20:- Start from Howrah Station at 13:40 by 12860 Gitanjali for Nagpur Station.

24/02/20:- Reaching Nagpur Station at 07:20hrs. Start from Nagpur Station at 08:00hrs by Bus for Tadoba National Park. Reaching Tadoba at 12.00hrs and transfer at Forest Rest House and Dormitory.

Afternoon and Evening : Biodiversity specimen collection studies. Night stay at Tadoba.

25/02/20:- Morning and Afternoon coverage Tadoba National Park Safari (Junona and Agarjhari Zone) by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.

Evening : Biodiversity studies.

Night stay at Tadoba.

26/02/20:- Start from Tadoba at 08.00hrs by Bus for Bor. Reaching Bor at 12.00hrs and transfer at Forest Rest House and Dormitories.

Afternoon and Evening : Biodiversity specimen collection studies.

Night stay at Bor.

27/02/20:- Morning and Evening coverage Bor National Park Safari (Bordharan) by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.

Evening : Biodiversity studies.

Night stay at Bor.

28/02/20:- Start from Bor at 06.00hrs by Bus for Nagpur Station. Reaching Nagpur Station at 09.00hrs. Start from Nagpur Station at 10.10hrs by 12129 Azad Hind Express for Howrah Station.

29/02/20:- Reaching Howrah Station at 04.15hrs.

The Tour Ends

ACCOMPANYING PERSONS :-

1. Prof. Swagata Chattopadhyay
2. Sri Sunil Kr Pramanik

TADOBA-ANDHARI TIGER RESERVE

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

Location

Coordinates: 20◦10′N 79◦24′E

Total area covered by Tadoba National Park is 116.55 sq.kms.

It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.

The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the Tadoba National Park, created in the year 1955.

Significance

Tadoba National park contains some of the best forest tracks and is endowed with rich biodiversity. It is famous for its natural heritage. Tadoba is an infinite treasure trove of innumerable species of trees and plants - and wildlife that includes Tigers, Panthers, Sloth Bears, Hyenas, Jackals, Wild Dogs, Bison, Barking Deer, NilGai, Sambar, and Cheatal.

Known for its rich biodiversity, the Tadoba National Park is nothing less than a paradise for wildlife enthusiasts. Owing to the presence of the big cats, the park was announced as the 41st Tiger Reserve of India. Along with the tigers, the park provides a home to the Wild Boar, Leopard, Spotted Deer, Rusty Spotted Cat, Indian Mouse Deer, Sambar, Gaur, Sloth Beer, Four Horned Antelope, Flying Squirrel and so on.

Etymology

The word 'Tadoba' is derived from the name of God "Tadoba" or "Taru," which is praised by local tribal people of this region and "Andhari" is derived from the name of Andhari river that flows in this area

Type of Forest

Tadoba reserve is a predominantly southern tropical dry deciduous forest

Physical Factors

Temperature:

Winters are cold with average temperature from 9 to 25 degree celsius.

Summers are dry and the temperature is between 30 to 45 degrees celsius.

Rainfall:

Tadoba
experiences a humid monsoon with rainfall upto 50 inch.

Topography

Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges. Densely forested hills kiform Northern and Western boundary of this area. Elevation of these hills ranges from 200mts to 350mts
Tadoba lake acts as the buffer between the forest and the extensive farmland which extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

Geography

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.
To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.
Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smooth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and caves provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari ranges. The south part of the park is less hilly than the remainder.

FAUNA:-

Mammals: 65 of the keystone species Bengal tiger, Indian Leopard, Sloth bear, Wild dog, Jackal, Sambar, Gaur, Nilgai, Dhole, striped Hyena, small Indian civet, jungle cats, Indian Bison, Barking Deer, Blue Bull, Spotted Dee, Chausingha, Ratel, Flying Squirrel, Wild Boar, Langur, marsh Crocodile.

Reptiles: Indian python, common Indian monitor. Terrapins, Indian star tortoise, Indian cobra Russel's viper

Birds: 195 species of birds. The grey-headed fish eagle, the crested serpent eagle, the changeable hawk-eagle,the raptors.

Other interesting species include the orange-headed thrush, Indian pitta, crested treeswift, stone curlew, crested honey buzzard, paradise flycatcher, bronze-winged jacana and lesser goldenbacked woodpecker. Warblers and the black-naped blue flycatcher .
74 species of butterflies have been recorded including the pansies, monarch, Mormons and swordtails. Insect species include the endangered danaid egg-fly, great eggfly. Dragonflies, stick insects, jewel beetles and the praying mantis, giant wood spider, red wood, wolf spiders, crab spiders and lynx spiders. The most recent census, carried out in 2012, found that the core area has 43 tigers. There are another 22 tigers in the buffer area, and a further 35 in the area surrounding the park.
people can roam here throughout the year, thus they can be witness to spot the tiger and other opulence wild species along with the beautiful dense forest.

Flora

Bamboo	Bambusa sp.
Ain	Terminalia elliptica
Bija	Pterocarpus marsupium

Haldu	Haldina cordifolia
Salai	Boswellia serrata
Semal	Bombax ceiba
Shisham	Dalbergia sissoo
Bel	Aegle marmelos
Mahua	Madhuca longifolia
Palas	Butea monsperma
Hirda	Terminalia chebula
Tendu	Diospyros melanoxylon
Kusum	Schleichera oleosa
Dhawada	Anogeissus latifolia
Karya gum	Sterculia urens

Safari Zones in Tadoba

The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:

Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

Entry Gates for Safari in Tadoba

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai, etc. The movement of tourists inside the park is not restricted like in other

reserves, therefore one can completely enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

1. **Moharli Gate:** Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.
2. **Kuswanda**: The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.
3. **Kolara Gate:** This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.
4. **Navegaon Gate:** The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.
5. **Pangdi Gate:** The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.
6. **Zari Gate**: Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

Jeep Safari in Tadoba National Park

The Jeep Safari is the best thing that one can experience in Tadoba National Park. The open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting a tiger and other wild animals are relatively high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more.

The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where kithe jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives respectively.

A park guide has to accompany the jeep for security purpose. Also, the tourists can enter the park by presenting their personal information and identification papers at the gate and the foreigners by showing their passport in original.

The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow a set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

Safari

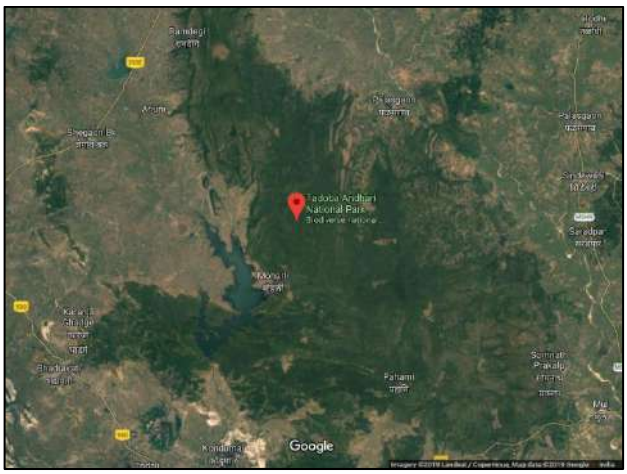
Group photograph

Safari Timing in Tadoba

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Moharli (Mohurli) Zone, Tadoba Zone, and Kolsa Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period	Morning		Afternoon	
	Entry	Exit	Entry	Exit
1st Oct to 30th Nov	6 AM - 8 AM	10:00 AM	2.30 PM – 4 PM	6.30 PM
1st Dec to 28th / 29th Feb	6.30 AM - 8.30 AM	11:00 AM	2 PM – 3.30 PM	6:00 PM
1st Mar to 30th April	5.30 AM – 7.30 AM	10:00 AM	3 PM – 4.30 PM	6.30 PM

1st May – 30thJune	5 AM – 7 AM	9.30 AM	3.30 PM – 5 PM	7:00 PM



Location of Tadoba Tiger Reserve on map

National parks in Maharashtra

To Reach Tadoba National Park

By Air

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities.

Best Time to Visit Tadoba

March to May is the best time to see tiger as summer temperatures are extremely high especially in the month of May. The monsoon begins from June to September and Vegetation and insect life come alive with the arrival of monsoon in mid June. The post monsoon starts from October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

Climate and Weather of Tadoba National Park

Winters stretch from November to February and day temperatures is between 25°-30°C and the park is looks green. Summers are too hot in Tadoba as the temperature increases to 47°C; even so it is the ideal time to sight mammals near water lakes as the vegetation is also rare, increasing visibility. The monsoon breaks in June with heavy rainfall of approx.1275 mm. and humidity is around 66%.

BIODIVERSITY

Biodiversity refers to the variety and variability of life on Earth. Biodiversity typically measures variation at the genetic, species, and ecosystem level. Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.

Biodiversity is not distributed evenly on Earth, and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversity is usually highest along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans.

There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

Types of Biodiversity:

1.Genetic Diversity-

- Different genes and combinations of genes within populations
- Allows population of a species to adopt to environmental changes

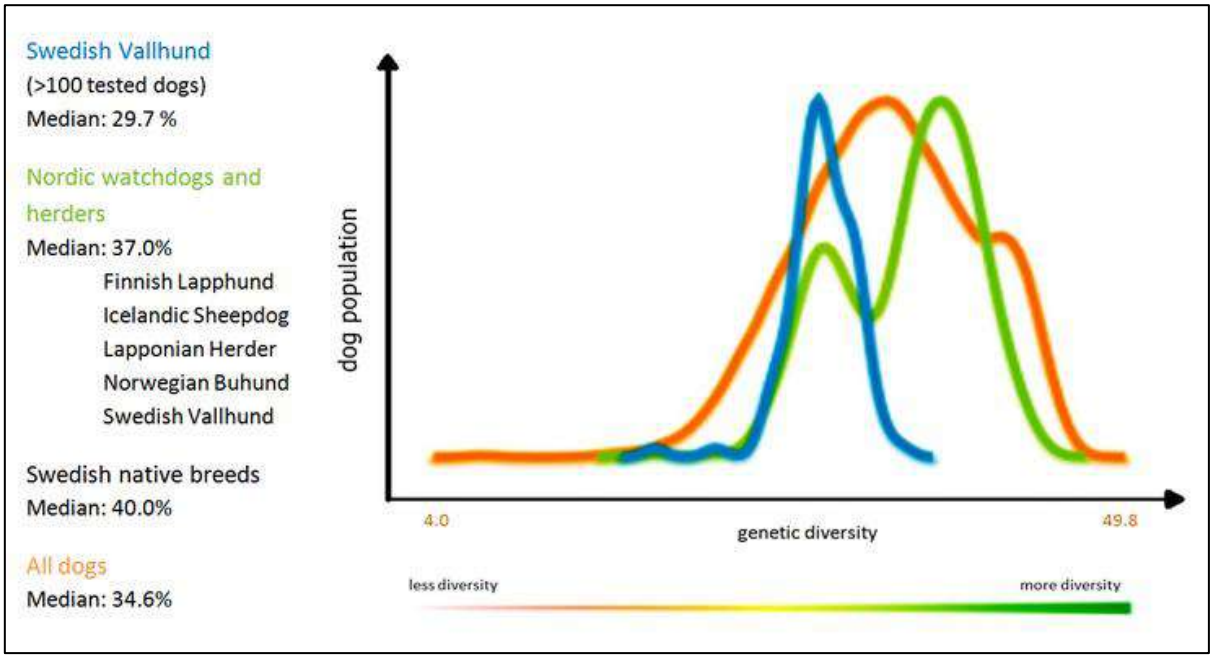


Fig: Genetic Diversity of Swedish Vallhund compared to other breeds[1]

2.Species Diversity-

- Different kinds of organism, relationships among species
- Refers to the number of kinds of species being found

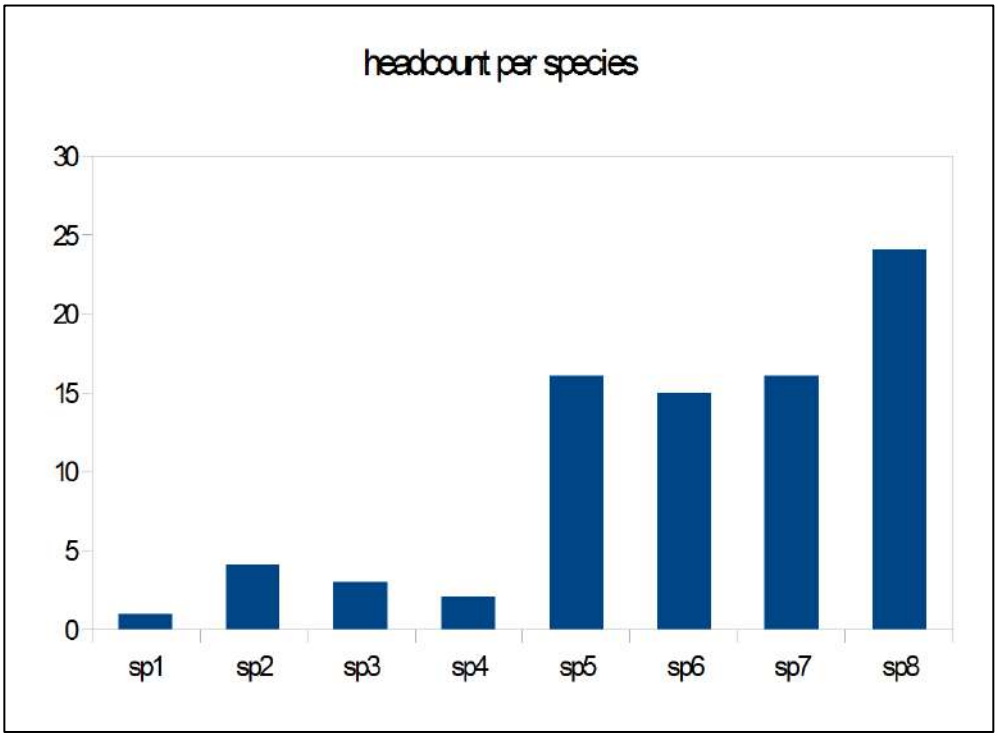


Fig: Fluctuations in species number[2]

3.Ecological Diversity-

- Different habitats, niches, species interactions
- An assemblage of species living in the same area and interacting with an environment

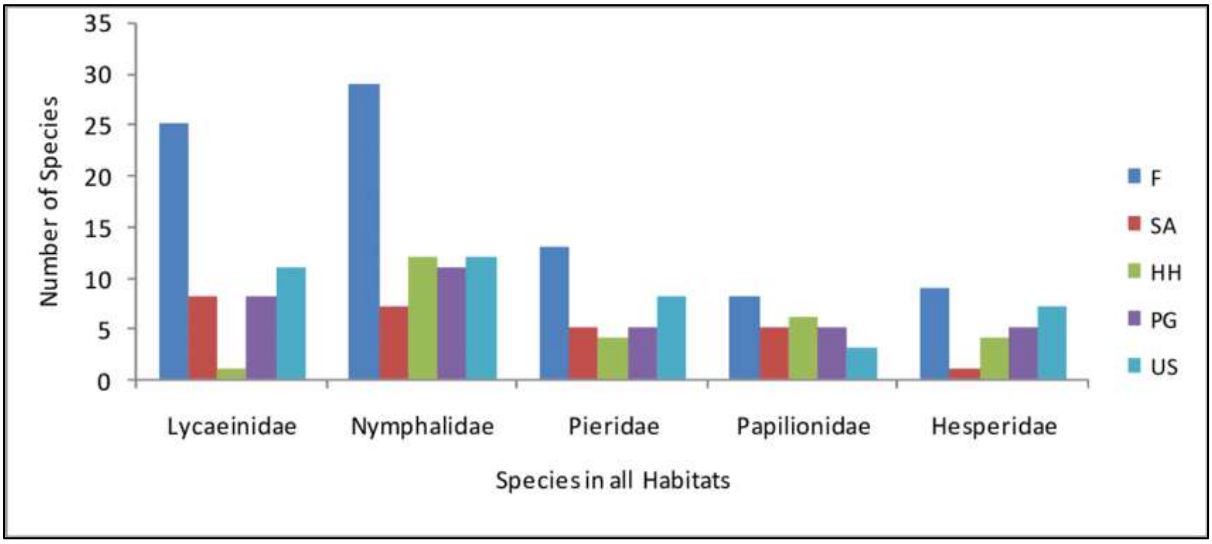


Fig: Species diversity in various Habitats[3]

Safari Census

We completed a total of 4 safaris in 2 Protected Areas, namely, Tadoba Tiger Reserve, Bor Tiger Reserve.

Requirements

1. Notebook and Pen – It was used to keep a note of the species we were able to see and keep a count of them.
2. Binoculars – Olympus Binoculars were used to look far into the depths of the dense forest and high up on the trees to identify the various species, mostly birds, and keep a count.
3. Camera – A Nikon D5200 Digital SLR camera, with a 70-300mm telephoto lens was used to keep photographic evidence of the species observed in their natural habitat.

Safari Census

We completed a total of 2 safaris in 1 Protected Area, namely, Tadoba-Andhari Tiger Reserve.

We went on all the safaris on Gypsies.

Tadoba-Andhari Tiger Reserve Census:

- Junona zone(Morning Safari) &
- Agarzari Zone (Afternoon Safari)

Avian Fauna

Species	Scientific Name	Count
1. Black Drongo	*Dicrurus macrocercus*	6
2. Parakeet	*Psittacula cyanocephala*	4
3. Black headed ibis	*Threskiornis melanocephalus*	7
4. Lesser egret	*Egretta garzetta*	14
5. Lesser whistling duck	*Dendrocygnaj avanica*	17

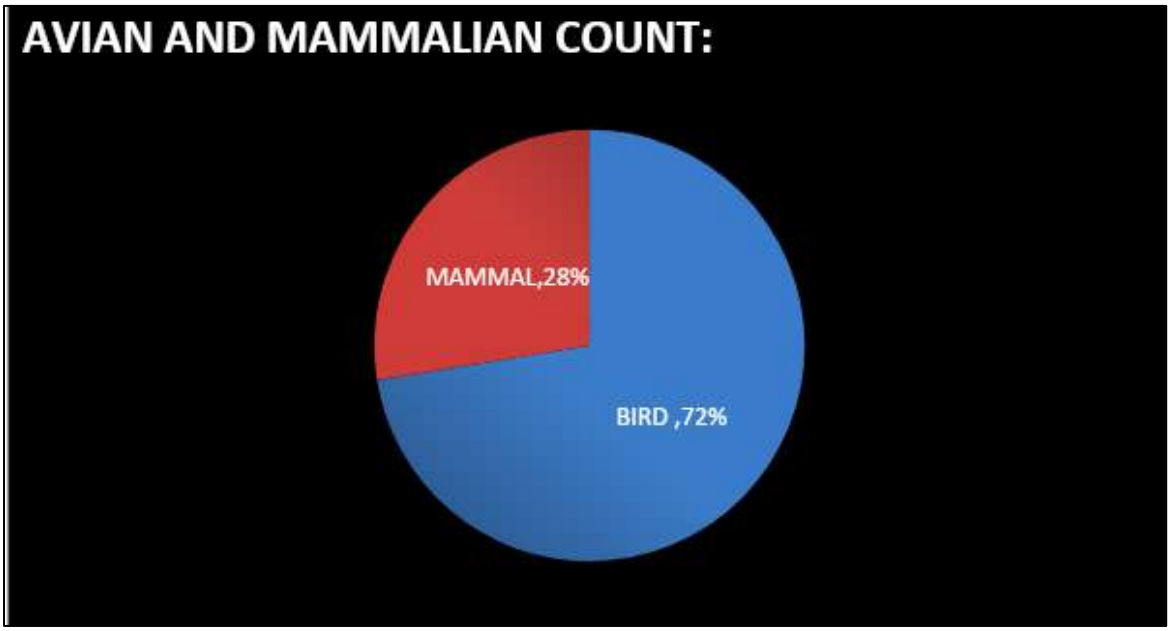
6. Jacana	*Metopidius indicus*	3
7. White eyed buzzard	*Butastur teesa*	2
8. Indian magpie Robin	*Turdus migratorius*	2
9. Common Kingfisher	*Haleyon smyrnesis*	3
10. Blue kingfisher	*Alcedo atthis*	1
11. Peafowl and peahen	*Pavo cristatus*	14
12. Asian Open -billed stork	*Anastomous oscitans*	9
13. Green Bee eater	*Merops orientalis*	2
14. Red vented bulbul	*Pycnonotus cafer*	6
15. Indian roller	*Coracias benghalensis*	5
16. Rufous treepie	*Dendrocitta vagabunda*	4
17. Rose-ringed parrot	*Psittacula krameri*	3
18. Green junglefowl	*Gallus varius*	12
19. Great Cormorant	*Phalacrocoracidae aristotelis*	11
20. Indian Pond Heron	*Ardeola grayii*	3
21. Purple Heron	*Ardea purpurea*	3
22. Grey Heron	*Ardea cinerea*	6
Species	***Scientific name***	**Count**
23. Jungle owl	*Glaucidium radiatum*	1
24. Serpent Eagle	*Spilornis cheela*	3
25. Jungle Babbler	*Turdoides striata*	16
26. Grey headed Fish eagle	*Ichthyophaga ichthyaetus*	1
27. Cuckoo	*Cocomantis flabelliformis*	2

28. Yellow Footed Green Pigeon	*Treron phoenicoptera*	5
29. Spotted dove	*Spilopelia chinensis*	6
30. Common starling	*Sturnus vulgaris*	3
31. Grey hornbill	*Buceros bicornis*	2 2
32. Purple moorhen	*Porphyrio porphyrio*	15
33. Red wattled lapwing	*Vanellus indicus*	4
34. Koel	*Eudynamys scolopaceus*	3
35. Golden oriole	*Oriolus kundoo*	1
36. Black hooded oriole	*Oriolus xanthornus*	2
37. Spotted-billed duck	*Anus poecilorhyncga*	3
38. Indian Long tailed shrike	*Lanius schach*	1
39. Greater Coucal	*Centropus sinesis*	3
40. Common Tailorbird	*Orthotomus sutorius*	4
41. Woodpecker	*Picidae sp.*	1
42. Eurasian Thick -knee bird	*Burhinus oedicnemus*	2
43. Red spurfowl	*Galloperdix spadicea*	1
44. Little Grebe	*Tachybaptis ruficollis*	1
45. Glossy Ibis	*Plegadis falcinellus*	1
46. Osprey	*Pandion haliaetus*	1
47. House sparrow	*Passer domesticus*	1
48. Shikra	*Accipiter badius*	1

TOTAL OBSERVED:		**221**

Mammalian Fauna

Species	***Scientific Name***	**Count**
1.Spotted deer	*Axis axis*	28
2.Langur	*Semnopithecus entellus*	18
3.Sambar	*Rusa unicolor*	15
4.Barking deer	*Muntiacus muntjak*	2
5. Indian Gaur	*Bos gaurus*	3
6.Dhole	*Cuon alpines*	4
7.Sloth bear	*Melursus ursinus*	3
8.Jackal	*Canis aureous*	1
9.Wild boar	*Sus scrofa*	4
10. Blue bull (nilgai)	*Boselaphus tragocamelus*	2
11.Tiger	*Panthera tigris*	1
12.Tiger cubs	*Panthera tigris*	3
TOTAL OBSERVED		**84**



Biodiversity Indices

Biodiversity is one of the primary interests of ecologists, but quantifying the species diversity of ecological communities is complicated. In addition to issues of statistical sampling, the rather arbitrary nature of delineating an ecological community, and the difficulty of positively identifying all of the species present, species diversity itself has two separate components:

1.) the number of species present (*species richness*), and

2.) their relative abundances (termed *dominance* or *evenness*).

As a result, many different measures (or indices) of biodiversity have been developed, such as

1. Shannon index

The idea behind this index is that the diversity of a community is similar to the

amount of information in a code or message. It is calculated in the following way:

$$H' = -\sum\{p_i \times \ln(p_i)\}$$

Where, pi is the proportion of individuals found in species i. For a well-sampled community, we can estimate this proportion as

pi = ni/N,

where, ni is the number of individuals in species i and N is the total number of individuals in the community.

Since by definition the pis' will all be between zero and one, the natural log makes all of the terms of the summation negative, which is why we take the inverse of the sum.

Mammalian diversity

Name	Count	pi	ln(pi)	Pi*ln(pi)
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gour	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053

Summed Biodiversity Index

Hm=(+1.618)

Avian diversity

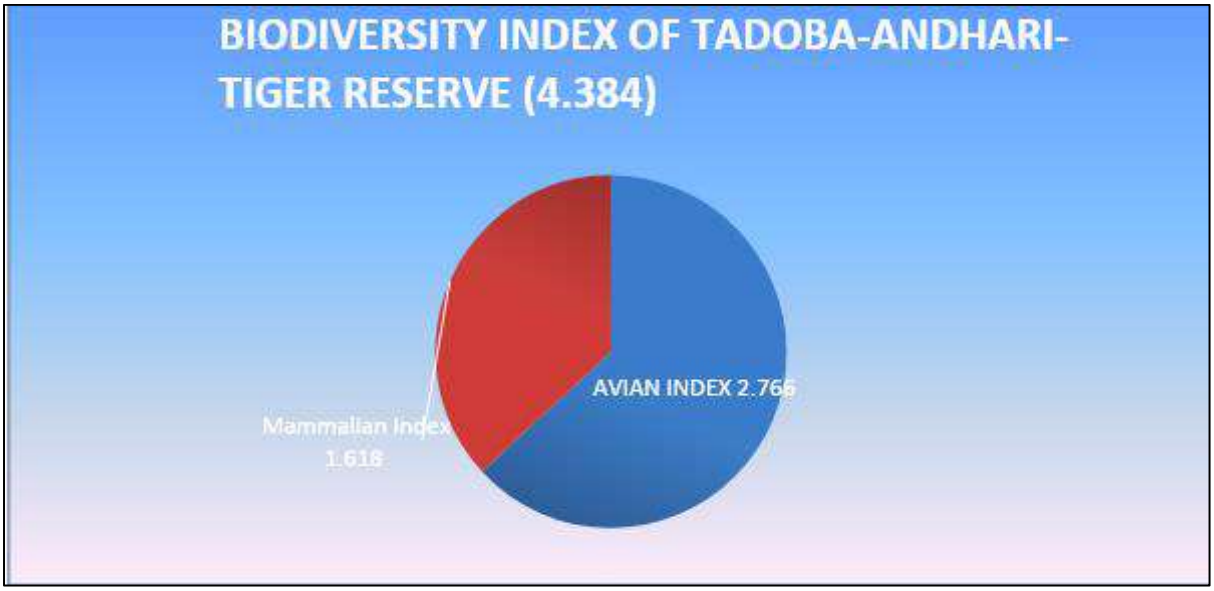
Name	Count	pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190
Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042
Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098
Koyel	3	0.013	-4.299	-0.058
Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149
Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073
Bulbul	6	0.027	-3.606	-0.098
White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042
Spotted billed duck	3	0.013	-4.299	-0.058

Green bee eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufous treepie	4	0.018	-3.452	-0.109
Rose ringed parrot	3	0.013	-4.299	-0.058
Great coucal	3	0.013	-4.299	-0.058
Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002
Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002
House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thickknee bird	2	0.009	-4.705	-0.042
Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013
Purple heron	3	0.013	-4.299	-0.058
Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109
Serpent eagle	3	0.013	-4.299	-0.058

Yellow headed fish eagle	1	0.004	-5.398	-0.002
Yellow footed green pegion	5	0.023	-3.788	-0.085
Indian long tailed shrink	1	0.004	-5.398	-0.002

Summed Biodiversity Index:

Ha=(+2.766)



Faunal Diversity - Tadoba

Mammalian Fauna

Sloth Bear (*Melursus ursinus*)

Sambar deer *(Rusa unicolor)*

Bison

Tiger (*Panthera tigris*)

Avian Fauna

Fork-tailed Drongo(*Dicrurus adsimilis)*

Indian Roller (*Coracias benghalensis*)

Peacock (*Pavo cristatus*)

Black headed ibis

Quadrate Study

Principal: When an ecologist wants to know how many organisms there in a particular habitat , it would not be feasible to count them all . Instead , he or she would be forced to count a small representative part of the population , called a sample . Sampling of plants or animals that do not move much (such as nails) , can be done using a sampling square called a quadrat . A suitable size of a quadrat depends on the size of the organisms being sampled . For example , to count plants growing on a school field , one could use a quadrat with sides 0.5 or 1 meter in length.

Setting for Quadrate

Materials & methods of Insect Collection:

-Materials Used

1.Small Garden Shovels

2.Forceps

3.A kill jar containing 70% alcohol

4.Insect pins

5.Zipback packers & plastic containers

6.Labels

7.String

8.Iron poles

9.Magnifying glass

10.Newspaper for collection

Methodology:

A suitable site was selected for the quadrate work to be done. An area of 1sq m was measured and the region was demarcated with the help of a string . The string was fixed in a square form of 1mX1m and the corners were fixed with iron poles . Thus the quadrat was formed and various species of flora and fauna were collected with the help of forceps.

Bush beating

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

Requirements:

Umbrella
Stick/Staff
70% Ethyl Alcohol
Air-tight Containers
Sterile Gloves
Tape

Methodology

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

Bush beating

Pitfall

Pitfall-traps: For Soil-surface-active Invertebrates

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capture more specific types of insects.

Requirements

- While carrying out Pitfall Trapping

1. Containers
2. Soap water
3. 70% Ethyl Alcohol
4. Forceps
5. Sterile Gloves
6. Sugar

Methodology

For the Pitfall traps, four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.
- Soap water was poured into the containers to make the surface slippery
- and thereby ensuring the avoidance of escape attempts by the captured insect.
- The pitfall trap was allowed to remain intact for about 6 hours. The collected insects were then poured into containers with 70% ethyl alcohol.
- Ethyl Alcohol was used as a preservative for the soft bodied animals as it maintained their elemental composition.

Setting of Pitfall Trap

Pitfall Trap

Specimens found

TADOBA

TIGER AS A KEYSTONE SPECIES

Ø A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist all together. A keystone species is often, but not always, a predator.

Ø Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex predator can regulate species abundance, distribution, diversity; which in turn can impact the health of terrestrial habitats.

Ø Additionally they provide essential food sources for the grazers and remove the sick and weak from the population of prey species.

Ø The decimation of these important tiger species can have cascading effects throughout the ecosystems they inhabit, resulting in economically and ecologically devastating consequences.

Ø In India Kanha National Park, the keystone species is Tiger and the "jewel" has been described as Barasingha.

Ø Tiger is the largest of the world's great cats. Barhasinha, gaur, sambar, chital, nilgai help to maintain wildlife population.

1. **Pug marking:**

Pugmark is the term used to refer to the footprint of most animals (especially mega fauna). "Pug" means foot in Hindi (Sanskrit 'padh'; Greek 'ped'). Every individual animal species has a distinct pugmark and as such this is used for identification.

Importance of Pugmark:

A. Wildlife conservationists are known to catalogue pugmarks in the areas they operate.

B. Pugmarks are also used for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries etc.

C. It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.

To make a plaster cast:

Ø **Materials:**

I. Plaster of Paris(medical quality).

II. Water.

III. A mug to prepare paste.

IV. A strip of thick paper or flexible aluminum.

ACKNOWLEDGEMENT

We would like to extend our gratitude to our respected Principal Dr. Arpita Mukherji ,our respected vice Principal , Dr. Supratim Das ,our Head of the department Dr. Narayan Chandra Das, our accompanying professor Dr. Swagata Chattopadhyay and Mr. Sunil Pramanik, alongside to all the professors in our department, who have all helped us all along, immensely. We are highly indebted to them for such an enriching experience that the college heads have solely arranged for the betterment of quality of learning for the students. It has been a marvellous opportunity to observe and learn amidst the inherent wonders of nature. This excursion has helped all of the classmates to work better as a team and we could all broaden our horizons in terms of ecological survey.

UNIVERSITY OF CALCUTTA

B.SC HONOURS IN ZOOLOGY SEM V
EXAMINATION
(UNDER C.B.C.S)

NAME- SRISTI DEB
ROLL NO: 18S-731
CU ROLL NO.183223-11-0105

CU REGISTRATION NO. 223-1211-0417-18

PAPER: CC 11

FIELD WORK ASSESSMENT 2020

ECOSYSTEM AND ITS BIODIVERSITY ASSESSMENT

INTRODUCTION

Aim Of Excursion:

The purpose of zoological excursion is to gain a much deeper knowledge about the topics related to the subject such as wildlife, nature and environment with the help of practical demonstration along with theoretical facts. While their purpose is essentially to educate, they can also be a fun bonding experience for everyone involved. Moreover without practical knowledge, the study of bio-science is incomplete. It also provides a scope to study wildlife and observe animals and their behaviors in their natural habitat.

Hence zoological excursion helps us to come in close contact with the flora and fauna of various places with different climatic conditions and atmospheric variations and in better understanding of the relation between flora and fauna.

Importance of excursion notebook :-

An outstanding field note book serves many potential purposes.

1. It is a valuable record of what you have seen, heard, discussed, and thought about in the field
2. It may contain the data which will lead to an oral presentation , a paper , and / or a thesis
3. It may be a graded portion a course
4. It may be something you and your relatives will find interesting decades in the future.

Field data collection purpose of field notes :-

1.Money:-Field books contain data which has been collected over weeks or months. The cost of collecting this data can range in the thousands of dollars .

2.Litigation :-Property surveys are subject to court review. The status of the field book can be a very important factor in litigation.

3. Efficiency :-The information in the fields book is used by office personnel to make drawings or calculation . Complete and correct notes are essential.

Excursion Diary

Tour programme Of Tadoba National Park And Bor Tiger Reserve

Date of journey :- 23rd February 2020

Train no and Name :- 12860 Gitanjali Express

Departure Time & place :- 13:40 hrs Howrah Station

Reporting Time & Place :- 12;00 hrs at Howrah Station New Complex in front of mail and Express Inquiry

Details of Tour Programme

23/02/20:- Start from Howrah Station at 13;40 ny 12860 Gitanjali for Nagpur station.

24/02/20:- Reaching Nagpur station at 07:20hrs. Start from Nagpur Station at 8:00 hrs by bus for Tadoba National Park. Reaching Tadoba at 12:00hrs and transfer at Forest Rest House and Dormitory.

Afternoon and Evening: Biodiversity Specimen Collection Studies.

25/02/20:- Morning and Afternoon coverage Tadoba National Park (Junona and Agarjhari Zone) by gypsy from 06:00 hrs to 10:00hrs and 14:30hrs to 18:00hrs.

Evening:- Biodiversity studies.

Night stay at Tadoba.

26/02/20:- Start from Tadoba at 08:00hrs by bus for Bor. Reaching Bor at 12:00hrs and transfer at Forest Rest House and Dormitories.

Afternoon and Evening : Biodiversity Specimen Collection Studies.

Night stay at Bor.

27/02/20:- Morning and Evening coverage Bor National Park Safari (Bordharan) by gypsy from 06:00hrs to10:00hrs and 14:30 hrs to 18:00hrs.

Evening: Biodiversity Studies.

Night stay at Bor.

28/02/20- Start from Bor at 06:00hrs by bus for Nagpur Station. Reaching Nagpur Station at 09:00hrs. Start from Nagpur Station at 10:10hrs by 12129 Azad Hind Express for Howrah Station.

29/02/20 :- Reaching Howrah Station at 04:15hrs

Accompanying persons:- 1. Swagata Chattopadhyay 2. Sri Sunil Kr Pramanik

TADOBA-ANDHARI TIGER RESERVE

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

Location

Coordinates: 20◦10’N 79◦24’E

Total area covered by Tadoba National Parkis 116.55 sq.kms.

It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.

The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the Tadoba National Park, created in the year 1955.

History

Legend holds that Taru was a village chief who was killed in a mythological encounter with a tiger. A shrine dedicated to the God Taru now exists beneath a large tree, on the banks of Tadoba Lake. The temple is frequented by adivasis, especially during a fair held annually in the Hindu month of Pausha, between December and January.

The Gond kings once ruled these forests in the vicinity of the Chimur hills. Hunting was completely banned in 1935. Two decades later, in 1955, 116.54 square kilometres (45.00 sq mi) was declared a national park. Andhari Wildlife Sanctuary was created in the adjacent forests in 1986, and in 1995 both the park and the sanctuary were merged to establish the present tiger reserve.

The Andhari Wildlife Sanctuary was formed in the year 1986 and was amalgamated with the park in 1995 to establish the present Tadoba Andhari Tiger Reserve.

Significance

Tadoba National park contains some of the best of forest tracks and endowed with rich biodiversity. It is famous for its natural heritage. Tadoba is an infinite treasure trove of innumerable species of trees and plants - and wildlife that includes Tigers, Panthers, Sloth Bears, Hyenas, Jackals, Wild Dogs, Bison, Barking Deer, Nil Gai, Sambar, and Cheatal.

Known for its rich biodiversity, the Tadoba National Park is nothing less than a paradise for wildlife enthusiasts. Owing to the presence of the big cats, the park was announced as the 41st Tiger

Reserve of India. Along with the tigers, the park provides a home to the Wild Boar, Leopard, Spotted Deer, Rusty Spotted Cat, Indian Mouse Deer, Sambar, Gaur, Sloth Beer, Four Horned Antelope, Flying Squirrel and so on.

Etymology

The word 'Tadoba' is derived from the name of God "Tadoba" or "Taru," which is praised by local tribal people of this region and "Andhari" is derived from the name of Andhari river that flows in this area

Type of Forest

Tadoba reserve is a predominantly southern tropical dry deciduous forest.

Physical Factors

Temperature:

Winters are cold with average temperature from 9 to 25 degreecelcius.

Summers are dry and temperature is between 30 to 45 degrees celcius.

Rainfall:

Tadoba experiences a humid monsoon with rainfall upto 50 inch.

Topography

Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges. Densely forested hills form Northern and Western boundary of this area. Elevation of these hills ranges from 200mts to 350mts Tadoba lake acts as the buffer between the forest and the extensive farmland which extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

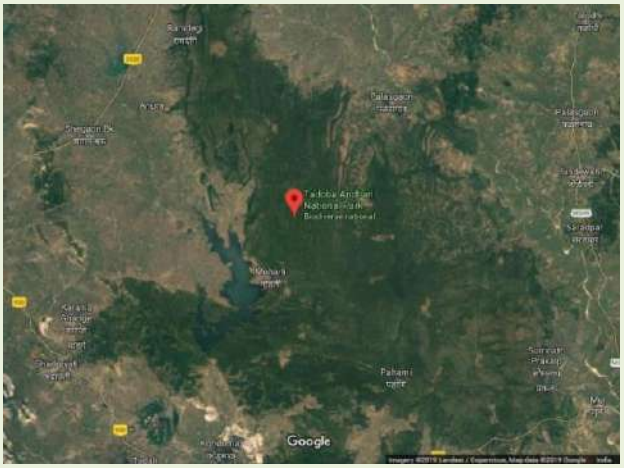
Geography

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa rang

es. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smooth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and caves provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari ranges. The south part of the park is less hilly than the remainder.



Location of Tadoba Tiger Reserve on map

Location of the accommodation during our trip

Safari Zones in Tadoba

The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and

a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:

Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

Entry Gates for Safari in Tadoba

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai, etc. The movement of tourists inside the park is not restricted like in other reserves, therefore one can completely enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

1. **Moharli Gate**: Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.
2. **Kuswanda**: The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.
3. **Kolara Gate:** This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.
4. **Navegaon Gate:** The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.
5. **Pangdi Gate:** The distance between Pangdi gate and Nagpur is 250 km and the number of

vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.

6. **Zari Gate:** Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

Jeep Safari in Tadoba National Park

The Jeep Safari is the best thing that one can experience in Tadoba National Park. The open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting a tiger and other wild animals are relatively high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more.

The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where the jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives respectively. A park guide has to accompany the jeep for security purpose. Also, the tourists can enter the park by presenting their personal information and identification papers at the gate and the foreigners by showing their passport in original.

The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

Safari Timing in Tadoba

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Moharli (Mohurli) Zone, Tadoba Zone, and Kolsa Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period	Morning		Afternoon	
	Entry	Exit	Entry	Exit
1st Oct to 30th Nov	6 AM - 8 AM	10:00 AM	2.30 PM – 4 PM	6.30 PM
1st Dec to 28th / 29th Feb	6.30 AM - 8.30 AM	11:00 AM	2 PM – 3.30 PM	6:00 PM
1st Mar to 30th April	5.30 AM – 7.30 AM	10:00 AM	3 PM – 4.30 PM	6.30 PM
1st May – 30thJune	5 AM – 7 AM	9.30 AM	3.30 PM – 5 PM	7:00 PM

To Reach Tadoba National Park:

By Air:

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train:

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road:

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities.

Best Time to Visit Tadoba

March to May is the best time to see tiger as summer temperatures are extremely high especially in the month of May. The monsoon begins from June to September and Vegetation and insect life come alive with the arrival of monsoon in mid June. The post monsoon starts from October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

Climate and Weather of Tadoba National Park

Winters stretch from November to February and day temperatures is between 25°-30°C and the park is looks green. Summers are too hot in Tadoba as the temperature increases to 47°C; even so it is the ideal time to sight mammals near water lakes as the vegetation is also rare, increasing visibility. The monsoon breaks in June with heavy rainfall of approx.1275 mm. and humidity is around 66%.

Group Photo At Tadoba Andheri Tiger Reserve With the teacher in charge

BIODIVERSITY

Biodiversity refers to the variety and variability of life on Earth. Biodiversity typically measures variation at the genetic, species, and ecosystem level. Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.

Biodiversity is not distributed evenly on Earth, and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversity is usually highest along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans.

There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

Types of Biodiversity:

Genetic Diversity

- Different genes and combinations of genes within populations
- Allows population of a species to adopt to environmental changes

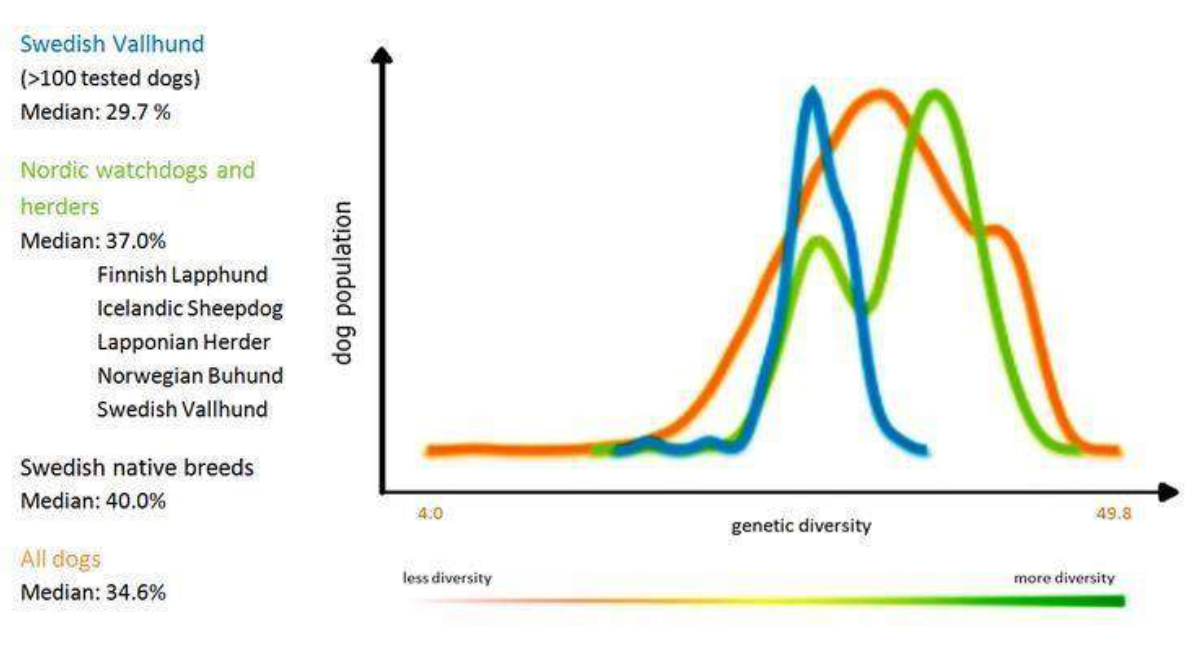
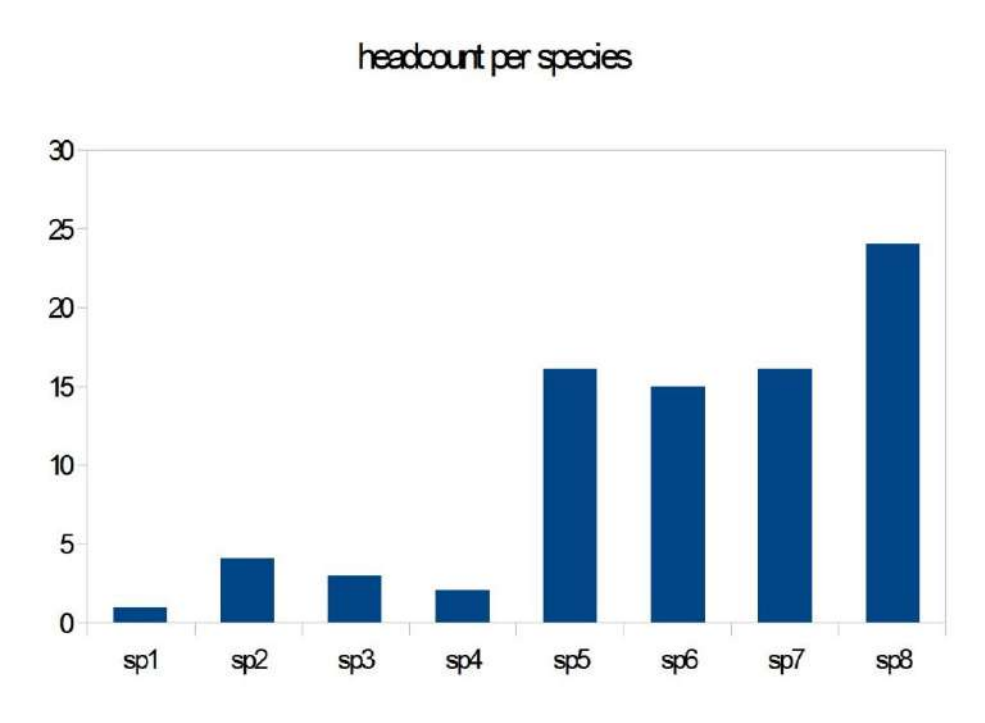


Fig: Genetic Diversity of Swedish Vallhund compared to other breeds[1]

Species Diversity

- Different kinds of organism, relationships among species
- Refers to the number of kinds of species being found

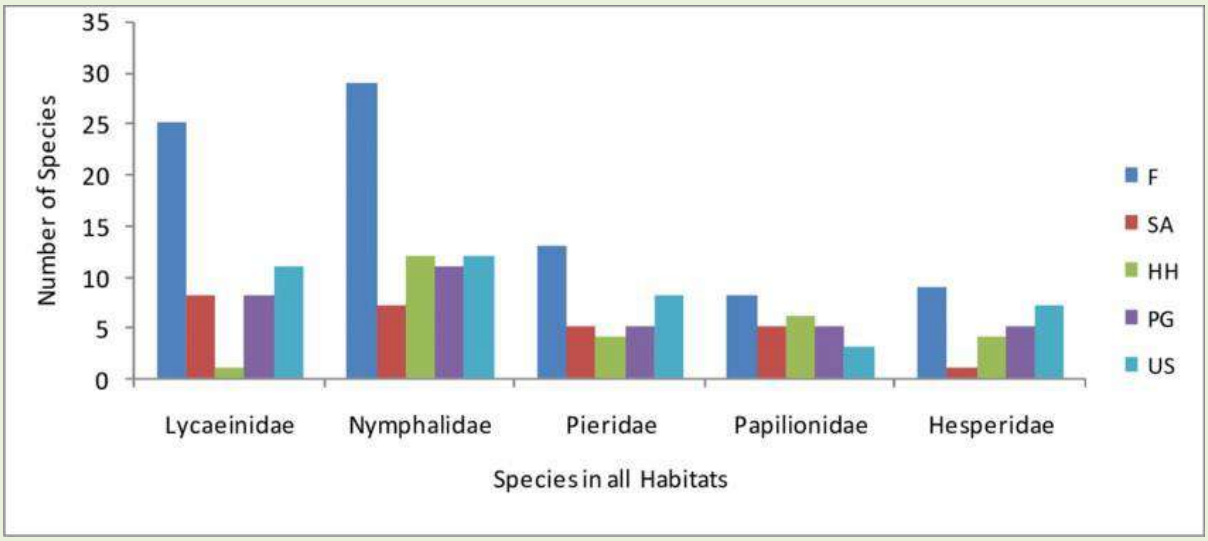


g: FluctuationFis in species number[2]

Ecological Diversity

- Different habitats, niches, species interactions

An assemblage of species living in the same area and interacting with an environment



Safari Census

We completed a total of 2safaris in 1 Protected Areas, namely, Tadoba Tiger Reserve. We went on all the safaris on Gypsies.

Requirements

1. Notebook and Pen – It was used to keep a note of the species we were able to see and keep a count of them.
2. Binoculars– Olympus Binoculars were used to look far into the depths of the dense forest and high up on the trees to identify the various species, mostly birds, and keep a count.
3. Camera- Cannon EOS 3000D SLR camera, with a 18-55mm telephoto lens was used to keep photographic evidence of the species observed in their natural habitat.

Tadoba-Andhari Tiger Reserve Census:

- Junona zone(Morning Safari) &
- Agarjhari Zone (Afternoon Safari)

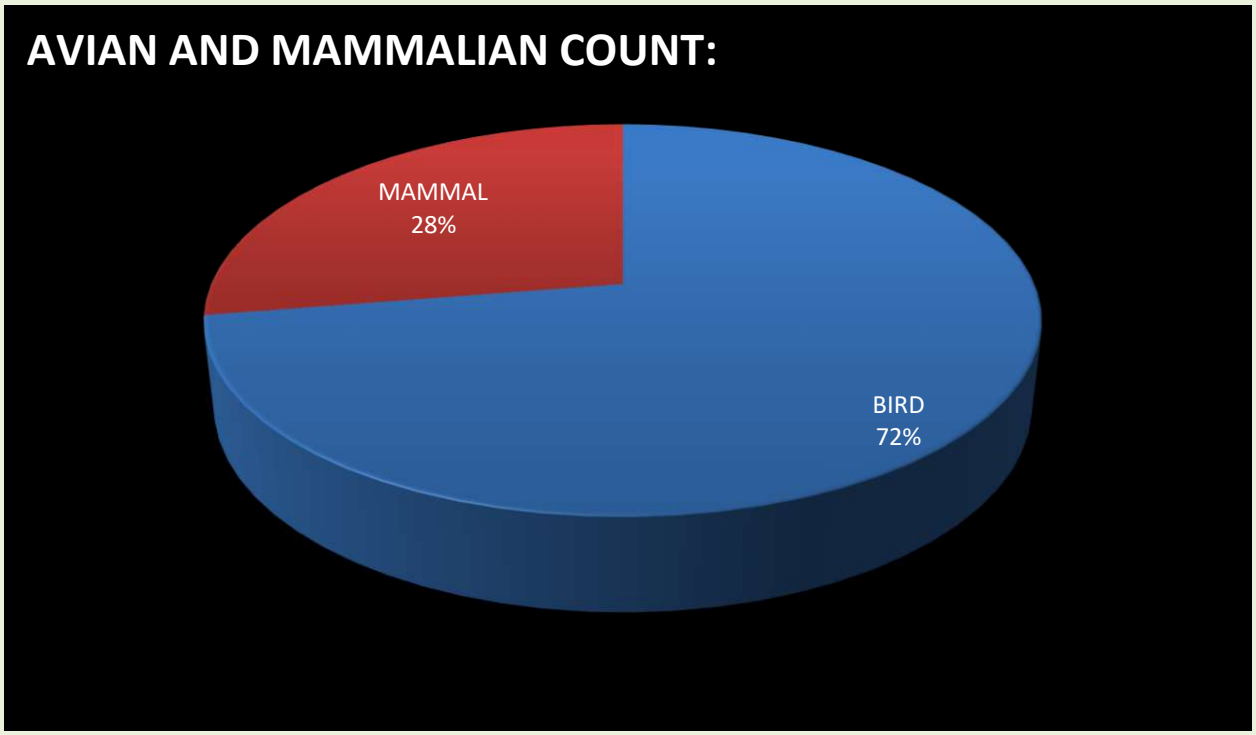
Species	Scientific name	Count
Black Drongo	*Dicrurus macrocercus*	6
Parakeet	*Psittacula cyanocephala*	4
Black headed ibis	*Threskiornis melanocephalus*	7
Lesser egret	*Egretta garzetta*	14
Lesser whistling duck	*Dendrocygnajavanica*	17
Jacana	*Metopidius indicus*	3

White eyed buzzard	*Butastur teesa*	2
Indian magpie Robin	*Turdus migratorius*	2
Common Kingfisher	*Haleyon smyrnesis*	3
Blue kingfisher	*Alcedo atthis*	1
Peafowl and peahen	*Pavo cristatus*	14
Asian Open -billed stork	*Anastomous oscitans*	9
Green Bee eater	*Merops orientalis*	2
Red vented bulbul	*Pycnonotus cafer*	6
Indian roller	*Coracias benghalensis*	5
Rufous treepie	*Dendrocitta vagabunda*	4
Rose-ringed parrot	*Psittacula krameri*	3
Green junglefowl	*Gallus varius*	12
eat Cormorant	*Phalacrocoracidae aristotelis*	11
Indian Pond Heron	*Ardeola grayii*	3
Jungle owl	*Glaucidium radiatum*	1
Serpent Eagle	*Spilornis cheela*	3
Jungle Babbler	*Turdoides striata*	16
Grey headed Fish eagle	*Ichthyophaga ichthyaetus*	1
Cuckoo	*Cocomantis flabelliformis*	2
Yellow Footed Green Pigeon	*Treron phoenicoptera*	5
Spotted dove	*Spilopelia chinensis*	6
Common starling	*Sturnus vulgaris*	3
Grey hornbill	*Buceros bicornis*	2
Purple moorhen	*Porphyrio porphyrio*	15
Red wattled lapwing	*Vanellus indicus*	4
Koel	*Eudynamys scolopaceus*	3
Golden oriole	*Oriolus kundoo*	1
Black hooded oriole	*Oriolus xanthornus*	2
Spotted-billed duck	*Anus poecilorhyncga*	3
Indian Long tailed shrike	*Lanius schach*	1

Greater Coucal	*Centropus sinesis*	3
Common Tailorbird	*Orthotomus sutorius*	4
Woodpecker	*Picidae sp.*	1
Eurasian Thick -knee bird	*Burhinus oedicnemus*	2
Red spurfowl	*Galloperdix spadicea*	1
Little Grebe	*Tachybaptis ruficollis*	1
Glossy Ibis	*Plegadis falcinellus*	1
Osprey	*Pandion haliaetus*	1
House sparrow	*Passer domesticus*	1
Shikra	*Accipiter badius*	1
	Total	221

Mammalian Fauna

Species	Scientific Name	Count
Spotted deer	*Axis axis*	36
Grey Langur	*Semnopithecus entellus*	4
Sambar Deer	*Rusa unicolor*	5
Indian gaur	*Bos gaurus*	29
Tigress	*Panthera tigris*	3
Wild boar	*Sus scrofa*	5
Sloth bear	*Melursus ursinus*	1
Barking deer	*Muntiacus muntjak*	1
Tiger cub	*Panthera tigris*	1
TOTAL		85



Shannon-Weiner Index

The Shannon-Weiner index being a measure of uncertainty,thus measures the diversity of a particular biogeographical region.

As a part of our endeavours to study the statistical aspect and interpretations of biodiversity, the various Shannon-Weiner indices of the four forests: Tadoba is calculated.

Interpretations of the mathematical data provide an insight into the biodiversity distribution of the fauna and hence are reflected by the species richness of the forests under study.

Mammalian diversity

Name	Count	pi	ln(pi)	Pi*ln(pi)
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gour	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053

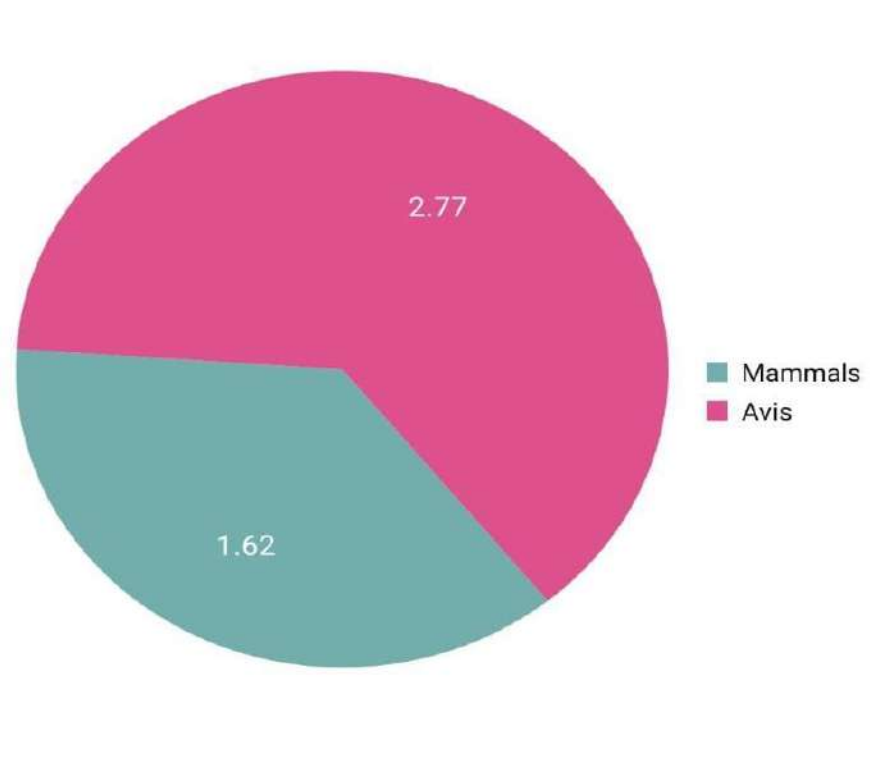
Avian diversity

Name	Count	pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190

Bulbul	6	0.027	-3.606	-0.098
White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042
Spotted billed duck	3	0.013	-4.299	-0.058
Green bee eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufous treepie	4	0.018	-3.452	-0.109
Rose ringed parrot	3	0.013	-4.299	-0.058
Great coucal	3	0.013	-4.299	-0.058
Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002
Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002

House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thickknee bird	2	0.009	-4.705	-0.042
Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013
Purple heron	3	0.013	-4.299	-0.058
Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109
Serpent eagle	3	0.013	-4.299	-0.058
Yellow headed fish eagle	1	0.004	-5.398	-0.002

Yellow footed green pegion	5	0.023	-3.788	-0.085
Indian long tailed shrink	1	0.004	-5.398	-0.002



Fauna Diversity Of Tadoba

Indian Roller

Black Headed Ibis

Rose Ringed Parakeet

Peafowl

Asian Opened Billed

Cotton Pygeme Goose

Indian Pond Heron

White Eyed Buzzard

Yellow Footed Green Pigeon

Pin Tailed Duck

Mammalian Diversity Of Tadoba

Sloth Bear

Tigress Madhuri

Spotted Deer

Sambar Deer

Bison

Indian Gaur

Bush beating

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

Requirements:

1. Umbrella
2. Stick/Staff
3. 70% Ethyl Alcohol
4. Air-tight Containers
5. Sterile Gloves
6. Tape

Methodology

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

Students carrying out Bush Beating

Pitfall

Pitfall-traps: For Soil-surface-active Invertebrates

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capture more specific types of insects.

Requirements

- While carrying out Pitfall Trapping
    1. Containers
    2. Soap water
    3. 70% Ethyl Alcohol
    4. Forceps
    5. Sterile Gloves
    6. Sugar

7. Methodology

For the Pitfall traps,four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

Sugar was scattered around the entire circumference of the containers to attract ants and other insect.

Soap water was poured into the containers to make the surface slippery and thereby ensuring the avoidance of escape attempts by the captured insect.

The pitfall trap was allowed to remain intact for about 6 hours. The collected insects were then poured into containers with 70% ethyl alcohol.

Ethyl Alcohol was used as a preservative for the soft bodied animals as it maintained their elemental composition.

Pitfall trap

Study of Quadrate

Principle:- When an ecologist wants to know how many organizations there are in a particular habitat, it would not be feasible to count them all. Instead he would be forced to count a smaller representative part of the population called sample. Sampling of plants & animals that don't move much (such as snails) can be done by using sampling square called quadrate. A suitable size of quadrate depends upon size of the organisms being sampled. For example to count plants growing on college campus one could use a quadrate with size 0.5to 1 meter in length.

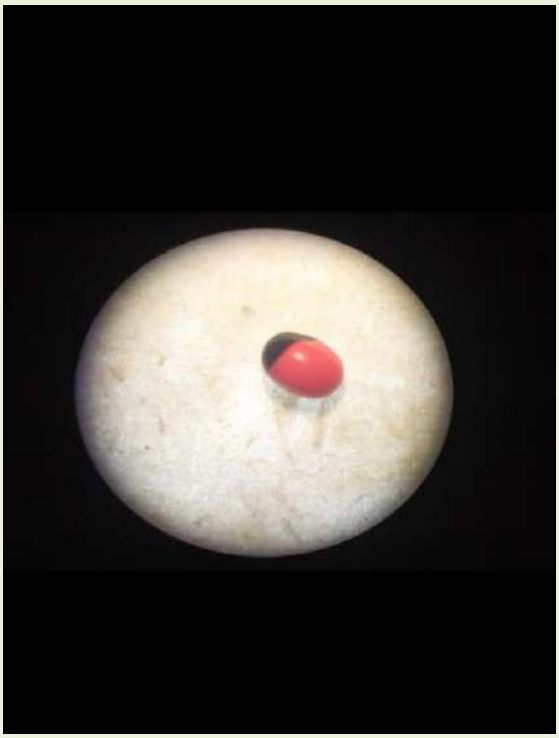
Materials & methods of insects collection:-

1. Small garden gloves
2. Forceps
3. A kill jar containing 70% alcohol
4. Insect pins
5. Ziploc packets & plastic container
6. Labels
7. Strings
8. Wood poles
9. Magnifying glass
10. Newspaper for collection

Methodology

A suitable site was selected for quadrate work to be done. An area of 1sq was measured & the region was demarcated with the help of string. The string was fixed in square form 1meter*1meter & the corners were fixed with wood poles. Thus the quadrate was formed & various species of flora & fauna were collected with the help of forceps.

Students carrying out quadrate study



Insects found In Bush Beating, Pitfall And Quadrate Study

TIGER AS A KEYSTONE SPECIES

- A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether. A keystone species is often, but not always, a predator.
- Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex species can regulate species abundance, diversity, distribution; which in turn can impact the health of terrestrial habitats.
- Additionally they provide essential food sources for the grazers and remove the sick and weak from population of prey species.
- The decimation of these tiger species can have cascading effects throughout the ecosystem they inhabit, resulting in economically and ecologically devastating consequences.
- In India's Kanha National Park, the keystone species is Tiger and the jewel has been described as "barasinha".
- Tiger is the largest of the world's great cats. Barasinha, Gaur, Sambar, chital, Nilgai help to maintain wildlife population.

PUG MARKING

Pug marking is the term used to refer to the footprint of most animals (specially mega fauna). "Pug" means foot in Hindi (Sanskrit –*Padh*; Greek –*Ped*. Every individual animal species has a different pugmark and as such it is used for identification.

- **IMPORTANCE OF PUGMARK:**

- Wildlife conservationists are known to catalogue pugmarks in the areas they operate.

- Pugmarks are also for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries, etc.

- It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.

- **TO MAKE A PLASTER CAST:**

- MATERIALS:

- Plaster of Paris (medical quality)

- Water

- A mug to prepare paste

- A strip of thick paper or flexible aluminium.

Pug Marks Of Tiger

Acknowledgment

I would like to express my special thanks of gratitude to our respected professors Dr. Swagata Chattopadhyay, Dr. Narayan Chandra Das, Dr. Samrat Bhattacharya, Dr. Partha Pal, Dr. Aniruddha Chatterjee, Dr. Malini kundu, Sri Sunil kr Pramanik as well as our principal ma'am Dr. Arpita Mukerji & vice principal sir Dr. Supratim Das who gave us the golden opportunity to do this wonderful field report , which also helped us in doing a lot of Research and we came to know about so many new things we're really thankful to them. Secondly I would also like to thank all my classmates who helped me a lot in finalizing this report within the limited time frame. Without all these helping hands I'll never be able to finish the field report of our memorable excursion to Tadoba-andhari Tiger Reserve.

UNIVERSITY OF CALCUTTA

EXCURSION TO TADOBA –ANDHARI TIGER RESERVE

NAME- SOUMILI MALLICK.

SEMESTER – 5 (CBCS).

SUBJECT- ZOOA.

CC - 11 .

COLLEGE ROLL NO. – 18S-732.

C.U. ROLL NO.- 183223 -11- 0113.

CU REGN. NO.- 223 -1211- 0448 -18.

INDEX:

INTRODUCTION

AIM OF EXCURSION:

An Educational Tour or A Field Trip is a visit to a place away from their normal place of study..The **aim** of this research is to :

- **Observe the subject in its natural state and possibly collect samples**.

The purpose of this trip is to:

- Usually ***o*bservation for education**, non-experimental research or to provide students with **experiences outside their everyday activities**,
- **Provide students an experience outside the class rooms or labs.**
- **It also provides an opportunity non experimental research and helps bring all the students to a common platform irrespective of their social, economic & cultural background.**

SOME BENEFITS OF AN EXCURSION:

- While on an educational tour/field trip a student gets to experience first-hand the concepts which help in **long term retention of the knowledge**.
- If the class room teaching is followed up by a field trip, it helps in clearing the concepts & results in **more effective learning**.
- It also **helps in application of ideas, theories & knowledge which ensure competence**. Discussing during the trip help the students to find solutions to real life problems and makes them innovative. Field trips helps reduce the pressure the boredom & monotony of having to attend a lecture. It is fun way of learning & makes it more enjoyable.
- While on an educational tour/field trip students have the opportunity to have lively discussion in an informal set up.
- Educational Tour/Field Trips also provide an opportunity to students to evolve and be on their own which helps make them **independent Interactions with people outside helps improve communication skills and makes them more accommodating. The educational tour/field trip helps in developing overall personality of students.**

- It is an opportunity **to inculcate the habit of travelling alone & in groups and making them more empathetic towards fellow students.**
- By such excursion students become interested in the exploration of their environment.
- It helps in developing cooperative **attitude and various others.**
- It **motivates the students for self-study and self-activity**. It helps in the **development of creative faculties of the students.**
- It helps in **development of power of observations , exploration, judgement and drawing inferences ,problem solving ability of students.**
- It helps in **developing qualities of resourcefulness, self-confidence, initiative, leadership amongst students.**
- Educational Tours & Field Trips provide **an opportunity of experiential learning to students** of all streams.

PURPOSE OF FIELD NOTES:

Field notes refer to qualitative notes recorded by scientists or researchers or students in the course of field research, during or after their observation of a specific organism or phenomenon they are studying.

- ✓ The notes are intended to be read as evidence that gives meaning and aids in the understanding of the phenomenon.
- ✓ Field notes allow the researcher to access the subject and record what they observe in an unobtrusive manner.
- ✓ Field notes are particularly valued in descriptive sciences such as ethnography, biology, ecology, geology, and archaeology, each of which have long traditions in this area.
- ✓ Writing in such a detailed manner may contribute to the personal development of a student.

BIODIVERSITY:

Biodiversity refers to the variety and variability of life on Earth. Biodiversity typically measures variation at the genetic, species, and ecosystem level. Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.

Biodiversity is not distributed evenly on Earth, and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversity is usually highest along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans.

There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

Types of Biodiversity:

Genetic Diversity:

- Different genes and combinations of genes within populations.
- Allows population of a species to adopt to environmental changes.

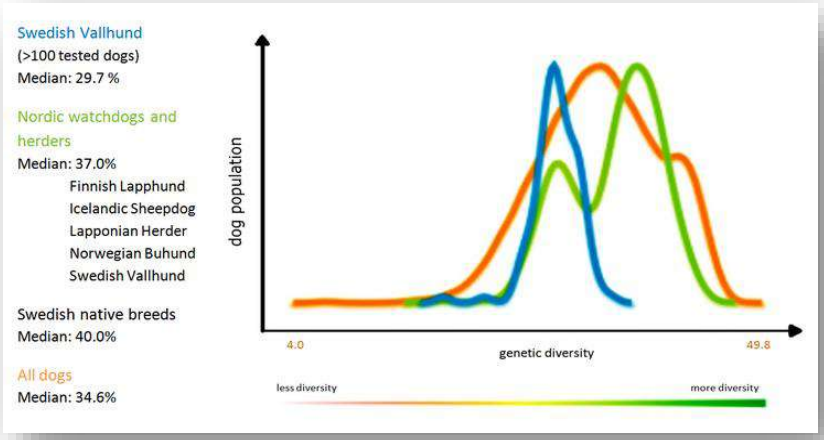


Fig: Genetic Diversity of Swedish Vallhund compared to other breeds.

Species Diversity:

- Different kinds of organism, relationships among species.
- Refers to the number of kinds of species being found.

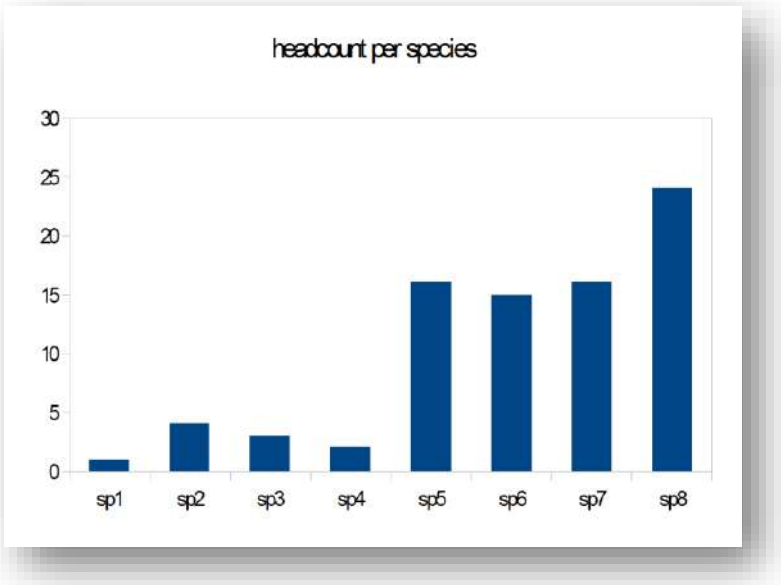


Fig: Fluctuations in species number.

Ecological Diversity:

- Different habitats, niches, species interactions

  -An assemblage of species living in the same area and interacting with an environment

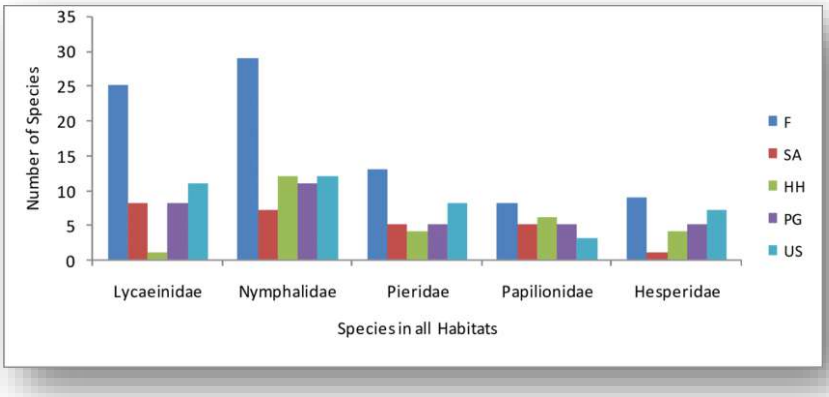


Fig: Species diversity in various Habitats.

EXCURSION DIARY:

>ITIENERY:

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE:

Date of Journey :- 23rd February 2020
Train No & Name :- 12860 Gitanjali Express
Departure Time & Place :- 13:40hrs Howrah Station
Reporting Time & Place :- 12:00hrs at Howrah Station New Complex in front of Mail and Express Inquiry

DETAILS of TOUR PROGRAMME

23/02/20:- Start from Howrah Station at 13:40 by 12860 Gitanjali for Nagpur Station.

24/02/20:- Reaching Nagpur Station at 07:20hrs. Start from Nagpur Station at 08:00hrs by Bus for Tadoba National Park. Reaching Tadoba at 12.00hrs and transfer at Forest Rest House and Dormitory.
Afternoon and Evening : Biodiversity specimen collection studies. Night stay at Tadoba.

25/02/20:- Morning and Afternoon coverage Tadoba National Park Safari (Junona and Agarjhari Zone) by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at Tadoba.

26/02/20:- Start from Tadoba at 08.00hrs by Bus for Bor. Reaching Bor at 12.00hrs and transfer at Forest Rest House and Dormitories.
Afternoon and Evening : Biodiversity specimen collection studies.
Night stay at Bor.

27/02/20:- Morning and Evening coverage Bor National Park Safari (Bordharan) by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at Bor.

28/02/20:- Start from Bor at 06.00hrs by Bus for Nagpur Station .Reaching Nagpur Station at 09.00hrs. Start from Nagpur Station at 10.10hrs by 12129 Azad Hind Express for Howrah Station.

29/02/20:- Reaching Howrah Station at 04.15hrs.

>ACCOMPANYING PERSONS:

- Prof. Swagata Chattopadhyay. - Sri Sunil Kr. Pramanik.

Maps of National Parks and Sanctuaries of Maharastra, Madhya Pradesh & TATR:

FIG: MAP OF MADHYA PRADESH SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

FIG: MAP OF TADOBA-ANDHARI TIGER RESERVE.

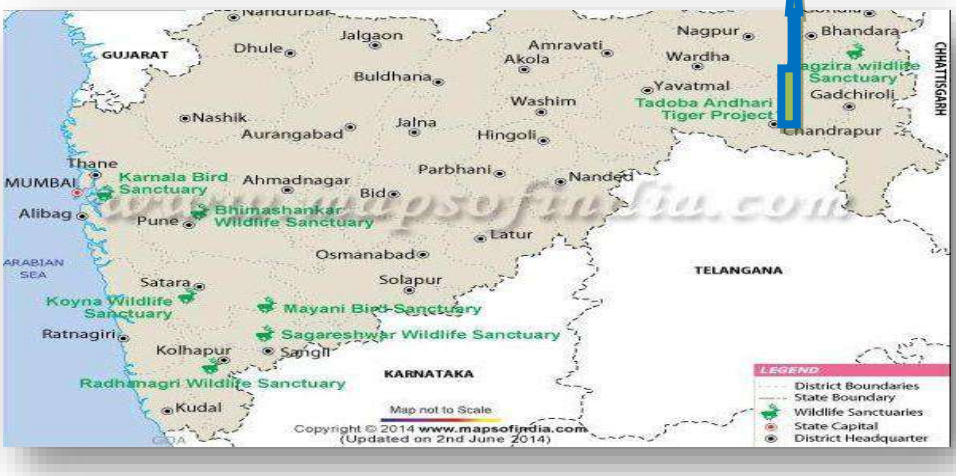


FIG: MAP OF MAHARASTRA SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

TADOBA-ANDHARI TIGER RESERVE

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

- **Location:**

Coordinates: 20◦10'N 79◦24'E

Total area covered by Tadoba National Parkis 116.55 sq.kms.

It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.

The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the Tadoba National Park, created in the year 1955.

- **History:**

Legend holds that Taru was a village chief who was killed in a mythological encounter with a tiger. A shrine dedicated to the God Taru now exists beneath a large tree, on the banks of Tadoba Lake. The temple is frequented by adivasis, especially during a fair held annually in the Hindu month of Pausha, between December and January.

The Gond kings once ruled these forests in the vicinity of the Chimur hills. Hunting was completely banned in 1935. Two decades later, in 1955, 116.54 square kilometres (45.00 sq mi) was declared a national park. Andhari Wildlife Sanctuary was created in the adjacent forests in 1986, and in 1995 both the park and the sanctuary were merged to establish the present tiger reserve.

The Andhari Wildlife Sanctuary was formed in the year 1986 and was amalgamated with the park in 1995 to establish the present Tadoba Andhari Tiger Reserve.

- **Significance:**

Tadoba National park contains some of the best of forest tracks and endowed with rich biodiversity. It is famous for its natural heritage. Tadoba is an infinite treasure trove of

innumerable species of trees and plants - and wildlife that includes Tigers, Panthers, Sloth Bears, Hyenas, Jackals, Wild Dogs, Bison, Barking Deer, Nil Gai, Sambar, and Cheatal. Known for its rich biodiversity, the Tadoba National Park is nothing less than a paradise for wildlife enthusiasts. Owing to the presence of the big cats, the park was announced as the 41st Tiger Reserve of India. Along with the tigers, the park provides a home to the Wild Boar, Leopard, Spotted Deer, Rusty Spotted Cat, Indian Mouse Deer, Sambar, Gaur, Sloth Beer, Four Horned Antelope, Flying Squirrel and so on.

- ## Etymology:

The word 'Tadoba' is derived from the name of God "Tadoba" or "Taru," which is praised by local tribal people of this region and "Andhari" is derived from the name of Andhari river that flows in this area.

- ## Type of Forest:

Tadoba reserve is a predominantly **southern tropical dry deciduous forest.**

- ## Physical Factors;

Temperature:

Winters are cold with average temperature from 9 to 25 degreecelcius.
Summers are dry and temperature is between 30 to 45 degrees celcius.

Rainfall:

Tadoba experiences a humid monsoon with rainfall upto 50 inch.

- ## Topography:

Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges. Densely forested hills form Northern and Western boundary of this area. Elevation of these hills ranges from 200mts to 350mts.
Tadoba lake acts as the buffer between the forest and the extensive farmland which extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

- **Geography:**

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smooth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and caves provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari ranges. The south part of the park is less hilly than the remainder.

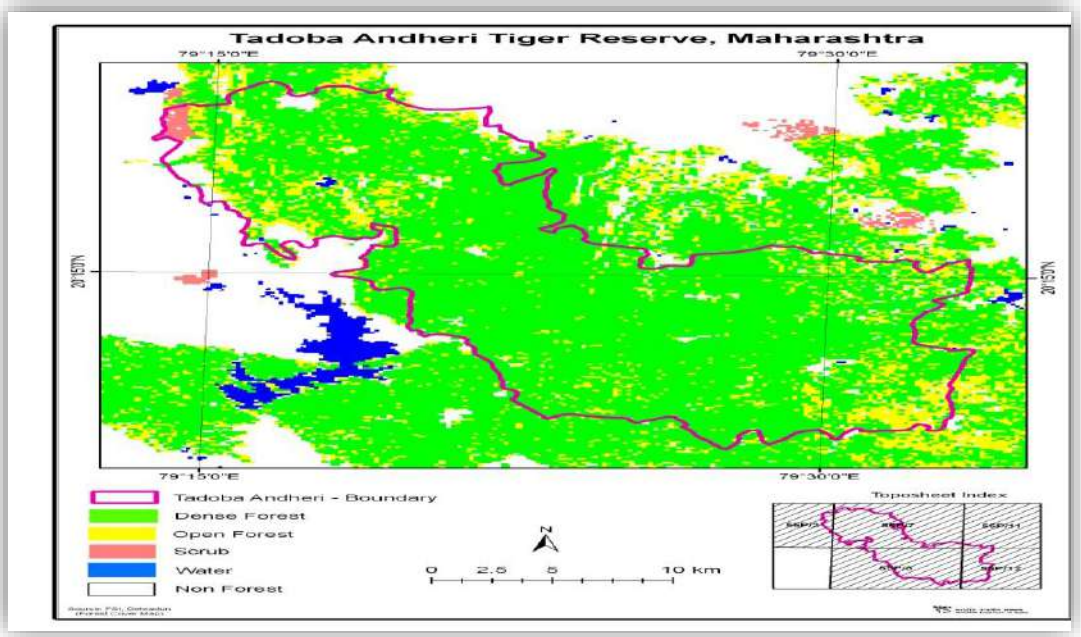


Fig: Map of Tadoba – Andhari Tiger Reserve with latitude and longitude.

Safari Zones in Tadoba:

The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:

Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

Entry Gates for Safari in Tadoba:

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai, etc. The movement of tourists inside the park is not restricted like in other reserves, therefore one can completely enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

1. **Moharli Gate**: Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.
2. **Kuswanda:** The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.

3. **Kolara Gate:** This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.
4. **Navegaon Gate:** The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.
5. **Pangdi Gate:** The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.
6. **Zari Gate:** Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

Jeep Safari in Tadoba National Park:

The Jeep Safari is the best thing that one can experience in Tadoba National Park. The open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting a tiger and other wild animals are relatively high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more. The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where the jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives respectively. A park guide has to accompany the jeep for security purpose. Also, the tourists can enter the park by presenting their personal information and identification papers at the gate and the foreigners by showing their passport in original.

The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

Safari Timing in Tadoba:

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Moharli (Mohurli) Zone, Tadoba Zone, and Kolsa Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period	Morning		Afternoon	
	Entry	Exit	Entry	Exit
1st Oct to 30th Nov	6 AM - 8 AM	10:00 AM	2.30 PM – 4 PM	6.30 PM
1st Dec to 28th / 29th Feb	6.30 AM - 8.30 AM	11:00 AM	2 PM – 3.30 PM	6:00 PM
1st Mar to 30th April	5.30 AM – 7.30 AM	10:00 AM	3 PM – 4.30 PM	6.30 PM
1st May – 30thJune	5 AM – 7 AM	9.30 AM	3.30 PM – 5 PM	7:00 PM

Group Photo at Tadoba –Andhari Tiger Reserve (Agarzari zone) .

To Reach Tadoba National Park:

By Air

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities.

Best Time to Visit Tadoba:

March to May is the best time to see tiger as summer temperatures are extremely high especially in the month of May. The monsoon begins from June to September and Vegetation and insect life come alive with the arrival of monsoon in mid June. The post monsoon starts from October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

Group photo at Tadoba-Andhari Tiger Reserve.

Abiotic Components

Abiotic components or abiotic factors are non-living chemical and physical parts of the environment that affect living organisms and the functioning of ecosystems. Abiotic components include physical conditions and non-living resources that affect living organisms in terms of growth, maintenance, and reproduction. All non-living components of an ecosystem, such as the atmosphere or water, are called abiotic components.

Abiotic variables found in terrestrial ecosystems can include things like rain, wind, temperature, altitude, soil, pollution, nutrients, pH, types of soil, and sunlight.

Determination of pH:

Requirements:-

- pH meter.

Method:-

The electrode of the calibrated pH meter was dipped in the sample and the reading was noted and recorded.

Observed pH of soil:

Place of recording of data	Date of Recording	pH of Soil
1. Tadoba - Andhari Tiger Reserve	26.02.2020	7.3

Determination of Temperature:

Requirements:-

- Laboratory Thermometer.

Method:-

The thermometer was hung in the open and kept undisturbed/dipped in the water and the temperature was recorded.

The **observed temperatures of the air** are tabulated below:

Place of Recording of data	Date of Recording	Time of Recording	Temperature of Air
1.Tadoba-Andhari Tiger Reserve	26.02.2020	6:45 am 8:45am	17.5°C 23°C

BIODIVERSITY- the key of diversity:

Biodiversity is the root of all living system. The earth is home to a rich and diverse array of living organism. The biodiversity is the natural biological capital of earth and presents opportunity to all.

India has a rich varied heritage of biodiversity, consisting of a wide spectrum of habitats. Biodiversity is indeed the bedrock of all bioindustrial development in the unusually large rural sector of our country. It is of enormous importance for human welfare.

Biodiversity is the soul of man and it renders him a healthy environment because it maintains nature's balance very effectively at any cost.

Indian flora is more varied than any other country of area. India's rich vegetational wealth and diversity is undoubtedly due to the immense variety of climatic and altitudinal variations coupled with rich ecological habitats. India is one of the topmost megadiversity nations, enriched by about 45,000 plants and about 50,000 species of animals amounting the world's **5%** biodiversity.

Flora:

Bamboo (*Bambusa sp.*)

Ain (*Terminalia elliptica)*

Karya gum (*Sterculiaurens)*

Bija (*Pterocarpus marsupium)*

Haldu (*Haldinacordifolia)*

Salai (*Boswellia serrata)*

Semal (*Bombax ceiba*)

Shisham (*Dalbergia sissoo)*

Bel (*Aegle marmelos)*

Mahua (*Madhucalongifolia)*

Palas (*Butea monsperma)*

Hirda (*Terminalia chebula)*

Tendu (*Diospyros melanoxylon)*

Kusum(*Schleicheraoleosa)*

Dhawada (*Anogeissuslatifolia)*

Safari Census

We completed a total of 2 safaris in 1 Protected Area, namely, Tadoba-Andhari Tiger Reserve.

We went on all the safaris on Gypsies.

Tadoba-Andhari Tiger Reserve Census:

- **Junona zone(Morning Safari) &**
- **Agarzari Zone (Afternoon Safari).**

Avian Fauna

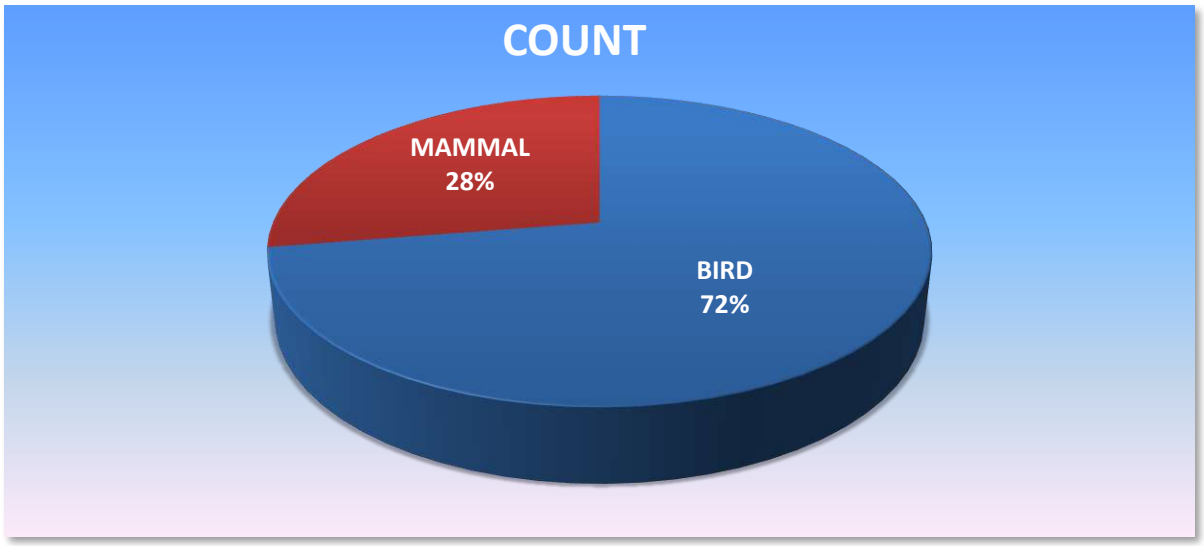
Species	*Scientific Name*	Count
1. Black Drongo	*Dicrurus macrocercus*	6
2. Parakeet	*Psittacula cyanocephala*	4
3. Black headed ibis	*Threskiornis melanocephalus*	7
4. Lesser egret	*Egretta garzetta*	14
5. Lesser whistling duck	*Dendrocygnajavanica*	17
6. Jacana	*Metopidius indicus*	3
7. White eyed buzzard	*Butastur teesa*	2
8. Indian magpie Robin	*Turdus migratorius*	2
9. Common Kingfisher	*Haleyon smyrnesis*	3
10. Blue kingfisher	*Alcedo atthis*	1
11. Peafowl and peahen	*Pavo cristatus*	14
12. Asian Open -billed stork	*Anastomous oscitans*	9
13. Green Bee eater	*Merops orientalis*	2
14. Red vented bulbul	*Pycnonotus cafer*	6
15. Indian roller	*Coracias benghalensis*	5
16. Rufous treepie	*Dendrocitta vagabunda*	4
17. Rose-ringed parrot	*Psittacula krameri*	3
18. Green junglefowl	*Gallus varius*	12
19. Great Cormorant	*Phalacrocoracidae aristotelis*	11
20. Indian Pond Heron	*Ardeola grayii*	3
21. Purple Heron	*Ardea purpurea*	3
22. Grey Heron	*Ardea cinerea*	6

Species	***Scientific name***	**Count**
23. Jungle owl	*Glaucidium radiatum*	1
24. Serpent Eagle	*Spilornis cheela*	3
25. Jungle Babbler	*Turdoides striata*	16
26. Grey headed Fish eagle	*Ichthyophaga ichthyaetus*	1
27. Cuckoo	*Cocomantis flabelliformis*	2
28. Yellow Footed Green Pigeon	*Treron phoenicoptera*	5
29. Spotted dove	*Spilopelia chinensis*	6
30. Common starling	*Sturnus vulgaris*	3
31. Grey hornbill	*Buceros bicornis*	2
32. Purple moorhen	*Porphyrio porphyrio*	15
33. Red wattled lapwing	*Vanellus indicus*	4
34. Koyel	*Eudynamys scolopaceus*	3
35. Golden oriole	*Oriolus kundoo*	1
36. Black hooded oriole	*Oriolus xanthornus*	2
37. Spotted-billed duck	*Anus poecilorhyncga*	3
38. Indian Long tailed shrike	*Lanius schach*	1
39. Greater Coucal	*Centropus sinesis*	3
40. Common Tailorbird	*Orthotomus sutorius*	4
41. Woodpecker	*Picidae sp.*	1
42. Eurasian Thick -knee bird	*Burhinus oedicnemus*	2
43. Red spurfowl	*Galloperdix spadicea*	1
44. Little Grebe	*Tachybaptis ruficollis*	1
45. Glossy Ibis	*Plegadis falcinellus*	1
46. Osprey	*Pandion haliaetus*	1
47. House sparrow	*Passer domesticus*	1
48. Shikra	*Accipiter badius*	1
TOTAL OBSERVED:		**221**

Mammalian Fauna

Species	***Scientific Name***	**Count**
1.Spotted deer	*Axis axis*	28
2.Langur	*Semnopithecus entellus*	18
3.Sambar	*Rusa unicolor*	15
4.Barking deer	*Muntiacus muntjak*	2
5. Indian Gaur	*Bos gaurus*	3
6.Dhole	*Cuon alpines*	4
7.Sloth bear	*Melursus ursinus*	3
8.Jackal	*Canis aureous*	1
9.Wild boar	*Sus scrofa*	4
10. Blue bull (nilgai)	*Boselaphus tragocamelus*	2
11.Tiger	*Panthera tigris*	1
12.Tiger cubs	*Panthera tigris*	3
TOTAL OBSERVED		**84**

- **PIE-CHART OF AVIAN AND MAMMALIAN FAUNA COUNTS:**



BIODIVERSITY INDEX

Quantifying the species diversity of ecological communities is complicated. In addition to issues of statistical sampling, the rather arbitrary nature of delineating an ecological community, and the difficulty of positively identifying all of the species present, species diversity itself has two separate components:

>> the number of species present (*species richness*), and

>> their relative abundances (termed *dominance* or *evenness*).

Diversity indicex- This is the measure of the number of species in an area and the relative distribution of individuals among those species. One such diversity index is:

Shannon-Wiener Diversity Index:

The idea behind this index is that the diversity of a community is similar to the amount of information in a code or message. It is calculated in the following way:

$$H' = -\sum\{p_i \times \ln(p_i)\}$$

Where, pi is the proportion of individuals found in species i. For a well-sampled community, we can estimate this proportion as

pi = ni/N,

where,ni is the number of individuals in species i and N is the total number of individuals in the community.

Since by definition the pis' will all be between zero and one, the natural log makes all of the terms of the summation negative, which is why wetake the inverse of the sum.

The Shannon-Weiner index being a measure of uncertainty,thus measures the diversity of a particular biogeographical region.

Interpretations of the mathematical data provide an insight into the biodiversity distribution of the fauna and hence are reflected by the species richness of the forests under study.

As a part of our endeavours to study the statistical aspect and interpretations of biodiversity, the Shannon-Weiner index of Tadoba-Andhari Tiger Reserve was calculated:

Avian biodiversity Index :

Name	Count	pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190
Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042
Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098
Koyel	3	0.013	-4.299	-0.058
Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149
Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073

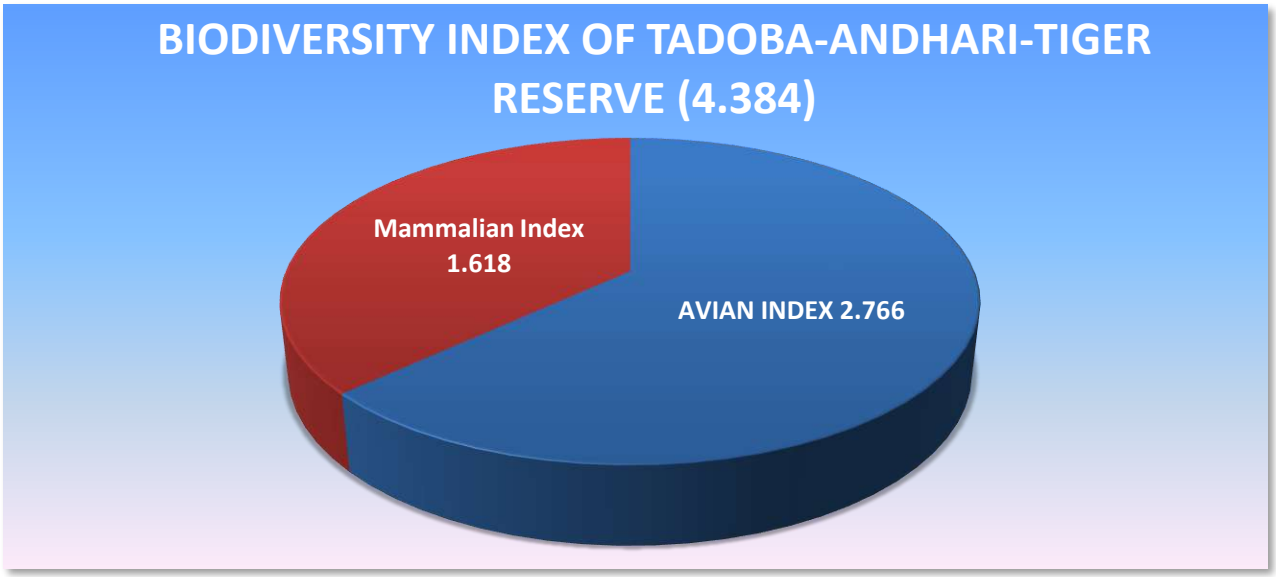
Name	Count	pi	ln(pi)	pi*ln(pi)
Bulbul	6	0.027	-3.606	-0.098
White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042
Spotted billed duck	3	0.013	-4.299	-0.058
Green bee-eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufous treepie	4	0.018	-3.452	-0.109
Rose- ringed parrot	3	0.013	-4.299	-0.058
Greater coucal	3	0.013	-4.299	-0.058
Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002
Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002
House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thick-knee bird	2	0.009	-4.705	-0.042
Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013
Purple heron	3	0.013	-4.299	-0.058
Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109
Serpent eagle	3	0.013	-4.299	-0.058
Yellow headed fish eagle	1	0.004	-5.398	-0.002
Yellow footed green pegion	5	0.023	-3.788	-0.085
Indian long tailed shrike	1	0.004	-5.398	-0.002
Summed Biodiversity Index (Ha)				**2.766**

Mammalian diversity Index:

Name	Count	pi	ln(pi)	Pi*ln(pi)
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gaur	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053
Summed Biodiversity Index(Hm)				**1.618**

Biodiversity Index of Tadoba-Andhari Tiger Reserve:

Hm+Ha = 2.766+1.618 =4.384



FAUNAL DIVERSITY: AVIAN DIVERSITY:

Rose-ringed Parrot (*Psittacula krameri)*

Yellow-footed Green Pegion *(Treron phoenicoptera)*

Indian Roller*(Coracias benghalensis)*

Indian long-tailed Shrike(*Lanius schach)*

Black Drongo (*Dicrurus macrocercus)*

Indian Pond Heron (Ardeola grayii)

Peafowl (*Pavo cristatus)*

Black-headed Ibis (*Threskiornis melanocephalus)*

Crested-Serpent Eagle (*Spilornis cheela)*

-: MAMMALIAN FAUNA :-

Tigress Madhuri (*Panthera tigris*)

Sloth Bear (*Melursus ursinus)*

Pug mark of Sloth Bear

Sambar Deer(*Rusa unicolor)*

Langur (*Semnopithecus entellus)*

Spotted Deer (*Axis axis*)

Wild Boar (*Sus scrofa)*

Indian Gaur *(Bos gaurus)*

PITFALL

Pitfall-traps: For Soil-surface-active Invertebrates.

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capture more specific types of insects.

Requirements:

- While carrying out Pitfall Trapping

1. Containers
2. Soap water
3. 70% Ethyl Alcohol
4. Forceps
5. Sterile Gloves
6. Sugar

Methodology:

For the Pitfall traps,four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.
- Soap water was poured into the containers to make the surface slippery and thereby ensuring the avoidance of escape attempts by the captured insect.
- The pitfall trap was allowed to remain intact for about 6 hours. The collected insects were then poured into containers with 70% ethyl alcohol.
- Ethyl Alcohol was used as a preservative for the soft bodied animals as it maintained their elemental composition.

Students collecting samples from Pitfall trap.

Pitfall trap.

Students preparing Pitfall Trap.

BUSH-BEATING

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

Requirements:

1. Umbrella.
2. Stick/Staff.
3. 70% Ethyl Alcohol.
4. Air-tight Containers.
5. Sterile Gloves.
6. Tape.

Methodology:

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

Students performing Bush-beating.

Students performing bush beating and collecting samples.

Students collecting samples after Bush-beating.

QUADRAT-STUDY

Principle:- When an ecologist wants to know how many organizations there are in an particular habitat, it would not be feasible to count them all. Instead he would be forced to count a smaller representative part of the population called sample. Sampling of plants & animals that don't move much(such as snails) can be done by using sampling square called quadrat. A suitable size of quadrate depends upon size of the organisms being sampled. For example to count plants growing on college campus one could use a quadrat with size 0.5to 1 meter in length.

Materials & methods of insects collection :

1. Small garden gloves.
2. Forceps.
3. A kill jar containing 70% alcohol.
4. Insect pins.
5. Ziploc packets & plastic container.
6. Labels.
7. Strings.
8. Wood poles.
9. Magnifying glass.
10. Newspaper for collection .

Methodology:

A suitable site was selected for quadrat work to be done. An area of 1sq was measured & the region was demarcated with the help of string. The string was fixed in square form 1meter*1meter & the corners were fixed with wood poles. Thus the quadrat was formed & various species of flora & fauna were collected with the help of forceps.

Students preparing for Quadrat study.

Students preparing for Quadrat study.

FEW INSECT SAMPLEs COLLECTED FROM PITFALL, BUSH-BEATING, QUADRAT STUDY:

Phylum- Arthropoda

Phylum- Arthropoda

Phylum- Arthropoda

Phylum- Arthropoda

Phylum- Arthropoda

PUG-MARKING

Pug marking is the term used to refer to the footprint of most animals (specially mega fauna). "Pug" means foot in Hindi (Sanskrit –*Padh*; Greek – *Ped*. Every individual animal species has a different pugmark and as such it is used for identification.

IMPORTANCE OF PUGMARK:

- ✓ **Wildlife conservationists are known to catalogue pugmarks in the areas they operate.**
- ✓ **Pugmarks are also for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries, etc.**
- ✓ **It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.**

❖ TO MAKE A PLASTER CAST

➢ MATERIALS:

- **Plaster of Paris (medical quality)**
- **Water**
- **A mug to prepare paste**
- **A strip of thick paper or flexible aluminium.**

Pug mark of Tiger at Tadoba-Andhari Tiger Reserve(Junona Zone).

TIGER AS A KEYSTONE SPECIES

- A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether. A keystone species is often, but not always, a predator.

- Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex species can regulate species abundance, diversity, distribution; which in turn can impact the health of terrestrial habitats.

- Additionally they provide essential food sources for the grazers and remove the sick and weak from population of prey species.

- The decimation of these tiger species can have cascading effects throughout the ecosystem they inhabit, resulting in economically and ecologically devastating consequences.

- In India's Kanha National Park, the keystone species is Tiger and the jewel has been described as "barasinha".

- Tiger is the largest of the world's great cats. Barasinha, gaur, sambar, chital, nilgai help to maintain wildlife population.

Tigress Madhuri at Tadoba-Andhari Tiger Reserve (Junona Zone).

ACKNOWLEDGEMENT:

I would like to express my heartfelt thanks and gratitude to the Principal of Scottish Church College, Dr. Arpita Mukerji, Vice- Principal, Dr. Supratim Das , HOD of Zoology Dept. Dr. Narayan Chandra Das and to our respected professors of Zoology Department , Prof. Swagata Chattopadhyay, Dr. Samrat Bhattacharya, Dr. Partha Pal, Dr. Aniruddha Chatterjee, Dr. Malini Kundu, who gave us this golden opportunity to accomplish this project , which not only enriched us with a lot of knowledge but also gave us handful of practical experiences .

Secondly, l would also like to thank all my classmates who helped me a lot for successfully completing the field report amidst a deadly pandemic and within a limited time frame . Without everyone's active cooperation I would have never been able to finish this Field Report of our memorable Excursion to Tadoba-Andhari Tiger Reserve.

Date: 14.03.2021.

UNIVERSITY OF CALCUTTA

EXCURSION TO TADOBA –ANDHARI TIGER RESERVE

NAME- SRITAMA BANNERJEE.

SEMESTER – 5 (CBCS).

SUBJECT- ZOOA.

CC - 11 .

COLLEGE ROLL NO. – 18S-721.

C.U. ROLL NO.- 183223 -11- 0111.

CU REGN. NO.- 223 -1211- 0444 -18.

INDEX:

INTRODUCTION

AIM OF EXCURSION:

An Educational Tour or A Field Trip is a visit to a place away from their normal place of study..The **aim** of this research is to :

- **Observe the subject in its natural state and possibly collect samples**.

The purpose of this trip is to:

- Usually ***o*bservation for education**, non-experimental research or to provide students with **experiences outside their everyday activities**,
- **Provide students an experience outside the class rooms or labs.**
- **It also provides an opportunity non experimental research and helps bring all the students to a common platform irrespective of their social, economic & cultural background.**

SOME BENEFITS OF AN EXCURSION:

- While on an educational tour/field trip a student gets to experience first-hand the concepts which help in **long term retention of the knowledge**.
- If the class room teaching is followed up by a field trip, it helps in clearing the concepts & results in **more effective learning**.
- It also **helps in application of ideas, theories & knowledge which ensure competence**. Discussing during the trip help the students to find solutions to real life problems and makes them innovative. Field trips helps reduce the pressure the boredom & monotony of having to attend a lecture. It is fun way of learning & makes it more enjoyable.
- While on an educational tour/field trip students have the opportunity to have lively discussion in an informal set up.
- Educational Tour/Field Trips also provide an opportunity to students to evolve and be on their own which helps make them **independent Interactions with people outside helps improve communication skills and makes them more accommodating. The educational tour/field trip helps in developing overall personality of students.**

- It is an opportunity **to inculcate the habit of travelling alone & in groups and making them more empathetic towards fellow students.**
- By such excursion students become interested in the exploration of their environment.
- It helps in developing cooperative **attitude and various others.**
- It **motivates the students for self-study and self-activity**. It helps in the **development of creative faculties of the students.**
- It helps in **development of power of observations ,exploration, judgement and drawing inferences ,problem solving ability of students.**
- It helps in **developing qualities of resourcefulness, self-confidence, initiative, leadership amongst students.**
- Educational Tours & Field Trips provide **an opportunity of experiential learning to students** of all streams.

PURPOSE OF FIELD NOTES:

Field notes refer to qualitative notes recorded by scientists or researchers or students in the course of field research, during or after their observation of a specific organism or phenomenon they are studying.

- ✓ The notes are intended to be read as evidence that gives meaning and aids in the understanding of the phenomenon.
- ✓ Field notes allow the researcher to access the subject and record what they observe in an unobtrusive manner.
- ✓ Field notes are particularly valued in descriptive sciences such as ethnography, biology, ecology, geology, and archaeology, each of which have long traditions in this area.
- ✓ Writing in such a detailed manner may contribute to the personal development of a student.

BIODIVERSITY:

Biodiversity refers to the variety and variability of life on Earth. Biodiversity typically measures variation at the genetic, species, and ecosystem level. Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.

Biodiversity is not distributed evenly on Earth, and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversity is usually highest along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans.

There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

Types of Biodiversity:

Genetic Diversity:

- Different genes and combinations of genes within populations.
- Allows population of a species to adopt to environmental changes.

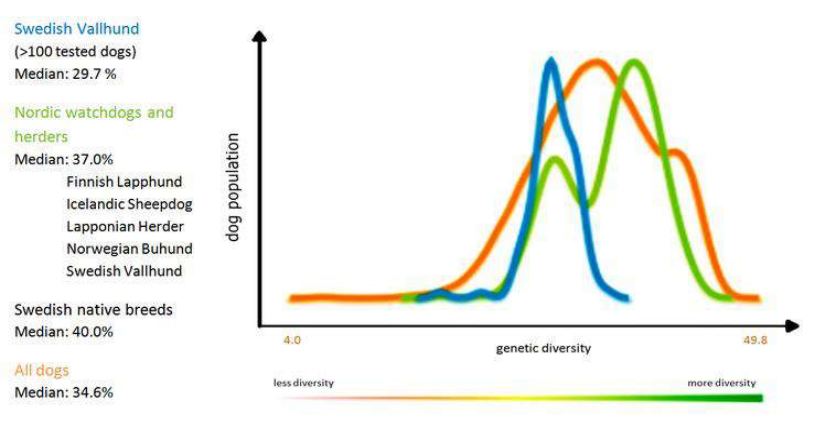


Fig: Genetic Diversity of Swedish Vallhund compared to other breeds.

Species Diversity:

- Different kinds of organism, relationships among species.
- Refers to the number of kinds of species being found.

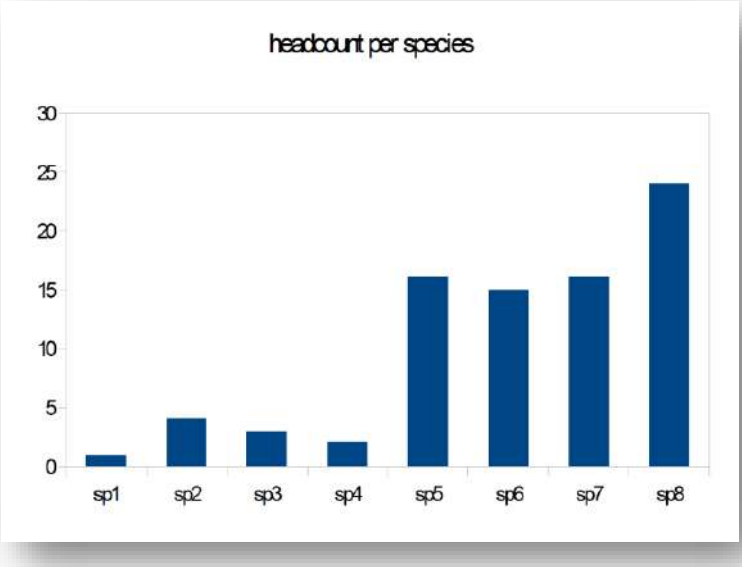


Fig: Fluctuations in species number.

Ecological Diversity:

- Different habitats, niches, species interactions

  -An assemblage of species living in the same area and interacting with an environment

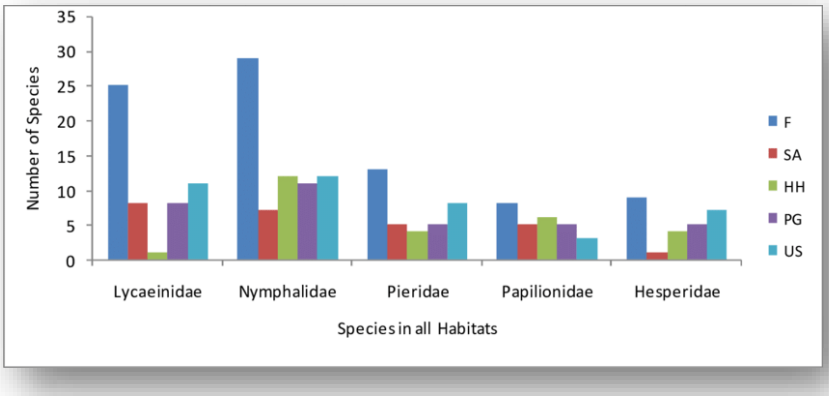


Fig: Species diversity in various Habitats.

EXCURSION DIARY:

>ITIENERY:

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE:

Date of Journey :- 23rd February 2020
Train No & Name :- 12860 Gitanjali Express
Departure Time & Place :- 13:40hrs Howrah Station
Reporting Time & Place :- 12:00hrs at Howrah Station New Complex in front of Mail and Express Inquiry

DETAILS of TOUR PROGRAMME

23/02/20:- Start from Howrah Station at 13:40 by 12860 Gitanjali for Nagpur Station.

24/02/20:- Reaching Nagpur Station at 07:20hrs. Start from Nagpur Station at 08:00hrs by Bus for Tadoba National Park. Reaching Tadoba at 12.00hrs and transfer at Forest Rest House and Dormitory.
Afternoon and Evening : Biodiversity specimen collection studies. Night stay at Tadoba.

25/02/20:- Morning and Afternoon coverage Tadoba National Park Safari (Junona and Agarjhari Zone) by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at Tadoba.

26/02/20:- Start from Tadoba at 08.00hrs by Bus for Bor. Reaching Bor at 12.00hrs and transfer at Forest Rest House and Dormitories.
Afternoon and Evening : Biodiversity specimen collection studies.
Night stay at Bor.

27/02/20:- Morning and Evening coverage Bor National Park Safari (Bordharan) by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at Bor.

28/02/20:- Start from Bor at 06.00hrs by Bus for Nagpur Station .Reaching Nagpur Station at 09.00hrs. Start from Nagpur Station at 10.10hrs by 12129 Azad Hind Express for Howrah Station.

29/02/20:- Reaching Howrah Station at 04.15hrs.

>ACCOMPANYING PERSONS:

- Prof. Swagata Chattopadhyay. - Sri Sunil Kr. Pramanik.

Maps of National Parks and Sanctuaries of Maharastra, Madhya Pradesh & TATR:

FIG: MAP OF MADHYA PRADESH SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

FIG: MAP OF TADOBA-ANDHARI TIGER RESERVE.

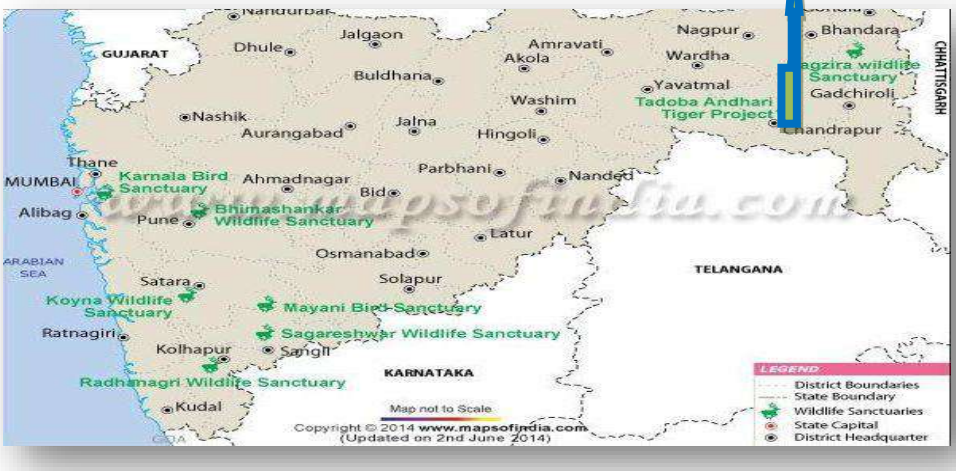


FIG: MAP OF MAHARASTRA SHOWING NATIONAL PARKS AND WILDLIFE SACTUARIES.

TADOBA-ANDHARI TIGER RESERVE

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

- **Location:**

Coordinates: 20◦10′N 79◦24′E

Total area covered by Tadoba National Parkis 116.55 sq.kms.

It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.

The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the Tadoba National Park, created in the year 1955.

- **History:**

Legend holds that Taru was a village chief who was killed in a mythological encounter with a tiger. A shrine dedicated to the God Taru now exists beneath a large tree, on the banks of Tadoba Lake. The temple is frequented by adivasis, especially during a fair held annually in the Hindu month of Pausha, between December and January.

The Gond kings once ruled these forests in the vicinity of the Chimur hills. Hunting was completely banned in 1935. Two decades later, in 1955, 116.54 square kilometres (45.00 sq mi) was declared a national park. Andhari Wildlife Sanctuary was created in the adjacent forests in 1986, and in 1995 both the park and the sanctuary were merged to establish the present tiger reserve.

The Andhari Wildlife Sanctuary was formed in the year 1986 and was amalgamated with the park in 1995 to establish the present Tadoba Andhari Tiger Reserve.

- **Significance:**

Tadoba National park contains some of the best of forest tracks and endowed with rich biodiversity. It is famous for its natural heritage. Tadoba is an infinite treasure trove of

innumerable species of trees and plants - and wildlife that includes Tigers, Panthers, Sloth Bears, Hyenas, Jackals, Wild Dogs, Bison, Barking Deer, Nil Gai, Sambar, and Cheatal. Known for its rich biodiversity, the Tadoba National Park is nothing less than a paradise for wildlife enthusiasts. Owing to the presence of the big cats, the park was announced as the 41st Tiger Reserve of India. Along with the tigers, the park provides a home to the Wild Boar, Leopard, Spotted Deer, Rusty Spotted Cat, Indian Mouse Deer, Sambar, Gaur, Sloth Beer, Four Horned Antelope, Flying Squirrel and so on.

- ## Etymology:

The word 'Tadoba' is derived from the name of God "Tadoba" or "Taru," which is praised by local tribal people of this region and "Andhari" is derived from the name of Andhari river that flows in this area.

- ## Type of Forest:

Tadoba reserve is a predominantly **southern tropical dry deciduous forest.**

- ## Physical Factors;

Temperature:

Winters are cold with average temperature from 9 to 25 degreecelcius.
Summers are dry and temperature is between 30 to 45 degrees celcius.

Rainfall:

Tadoba experiences a humid monsoon with rainfall upto 50 inch.

- ## Topography:

Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges. Densely forested hills form Northern and Western boundary of this area. Elevation of these hills ranges from 200mts to 350mts.
Tadoba lake acts as the buffer between the forest and the extensive farmland which extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

- **Geography:**

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smooth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and caves provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari ranges. The south part of the park is less hilly than the remainder.

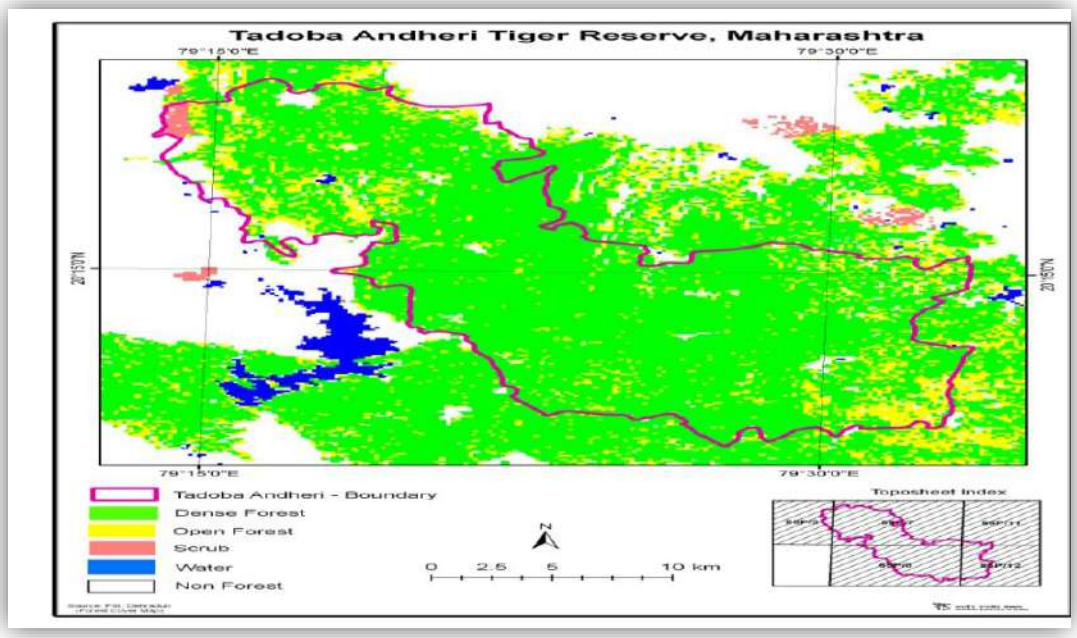


Fig: Map of Tadoba –Andhari Tiger Reserve with latitude and longitude.

Safari Zones in Tadoba:

The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:

Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

Entry Gates for Safari in Tadoba:

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai, etc. The movement of tourists inside the park is not restricted like in other reserves, therefore one can completely enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

1. **Moharli Gate**: Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.

2. **Kuswanda:** The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.
3. **Kolara Gate:** This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.

4. **Navegaon Gate:** The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.
5. **Pangdi Gate:** The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.
6. **Zari Gate:** Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

Jeep Safari in Tadoba National Park:

The Jeep Safari is the best thing that one can experience in Tadoba National Park. The open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting a tiger and other wild animals are relatively high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more. The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where the jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives respectively. A park guide has to accompany the jeep for security purpose. Also, the tourists can enter the park by presenting their personal information and identification papers at the gate and the foreigners by showing their passport in original.

The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

Safari Timing in Tadoba:

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Moharli (Mohurli) Zone, Tadoba Zone, and Kolsa Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period	Morning		Afternoon	
	Entry	Exit	Entry	Exit
1st Oct to 30th Nov	6 AM - 8 AM	10:00 AM	2.30 PM – 4 PM	6.30 PM
1st Dec to 28th / 29th Feb	6.30 AM - 8.30 AM	11:00 AM	2 PM – 3.30 PM	6:00 PM
1st Mar to 30th April	5.30 AM – 7.30 AM	10:00 AM	3 PM – 4.30 PM	6.30 PM
1st May – 30thJune	5 AM – 7 AM	9.30 AM	3.30 PM – 5 PM	7:00 PM

Group Photo at Tadoba –Andhari Tiger Reserve (Agarzari zone) .

To Reach Tadoba National Park:

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By Air

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities.

Best Time to Visit Tadoba:

March to May is the best time to see tiger as summer temperatures are extremely high especially in the month of May. The monsoon begins from June to September and Vegetation and insect life come alive with the arrival of monsoon in mid June. The post monsoon starts from October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

Group photo at Tadoba-Andhari Tiger Reserve.

Abiotic Components

Abiotic components or abiotic factors are non-living chemical and physical parts of the environment that affect living organisms and the functioning of ecosystems. Abiotic components include physical conditions and non-living resources that affect living organisms in terms of growth,maintenance, and reproduction. All non-living components of an ecosystem, such as the atmosphere or water, are called abiotic components.

Abiotic variables found in terrestrial ecosystems can include things like rain, wind, temperature, altitude, soil, pollution, nutrients, pH, types of soil, and sunlight.

Determination of pH:

Requirements:-

- pH meter.

Method:-

The electrode of the calibrated pH meter was dipped in the sample and the reading was noted and recorded.

Observed pH of soil:

Place of recording of data	Date of Recording	pH of Soil
1. **Tadoba-Andhari Tiger Reserve**	26.02.2020	7.3

Determination of Temperature:

Requirements:-

- Laboratory Thermometer.

Method:-

The thermometer was hung in the open and kept undisturbed/dipped in the water and the temperature was recorded.

The **observed temperatures of the air** are tabulated below:

Place of recording of data	Date of Recording	Time ofrecording	Temperature of Air
1.Tadoba-Andhari Tiger Reserve	26.02.2020	6:45 am 8:45am	17.5°C 23°C

BIODIVERSITY- the key of diversity:

Biodiversity is the root of all living system. The earth is home to a rich and diverse array of living organism. The biodiversity is the natural biological capital of earth and presents opportunity to all.

India has a rich varied heritage of biodiversity, consisting of a wide spectrum of habitats. Biodiversity is indeed the bedrock of all bioindustrial development in the unusually large rural sector of our country. It is of enormous importance for human welfare.

Biodiversity is the soul of man and it renders him a healthy environment because it maintains nature's balance very effectively at any cost.

Indian flora is more varied than any other country of area. India's rich vegetational wealth and diversity is undoubtedly due to the immense variety of climatic and altitudinal variations coupled with rich ecological habitats. India is one of the topmost megadiversity nations, enriched by about 45,000 plants and about 50,000 species of animals amounting the world's **5%** biodiversity.

Flora:

Bamboo (*Bambusa sp.*) **Kusum**(*Schleicheraoleosa)*

Ain (*Terminalia elliptica)* **Dhawada** (*Anogeissuslatifolia)*

Karya gum (*Sterculiaurens)*

Bija (*Pterocarpus marsupium)*

Haldu (*Haldinacordifolia)*

Salai (*Boswellia serrata)*

Semal (*Bombax ceiba*)

Shisham (*Dalbergia sissoo)*

Bel (*Aegle marmelos)*

Mahua (*Madhucalongifolia)*

Palas (*Butea monsperma)*

Hirda (*Terminalia chebula)*

Tendu (*Diospyros melanoxylon)*

Safari Census

We completed a total of 2 safaris in 1 Protected Area, namely, Tadoba-Andhari Tiger Reserve.

We went on all the safaris on Gypsies.

Tadoba-Andhari Tiger Reserve Census:

- **Junona zone(Morning Safari) &**
- **Agarzari Zone (Afternoon Safari).**

Avian Fauna

Species	*Scientific Name*	Count
1. Black Drongo	*Dicrurus macrocercus*	6
2. Parakeet	*Psittacula cyanocephala*	4
3. Black headed ibis	*Threskiornis melanocephalus*	7
4. Lesser egret	*Egretta garzetta*	14
5. Lesser whistling duck	*Dendrocygnajavanica*	17
6. Jacana	*Metopidius indicus*	3
7. White eyed buzzard	*Butastur teesa*	2
8. Indian magpie Robin	*Turdus migratorius*	2
9. Common Kingfisher	*Haleyon smyrnesis*	3
10. Blue kingfisher	*Alcedo atthis*	1

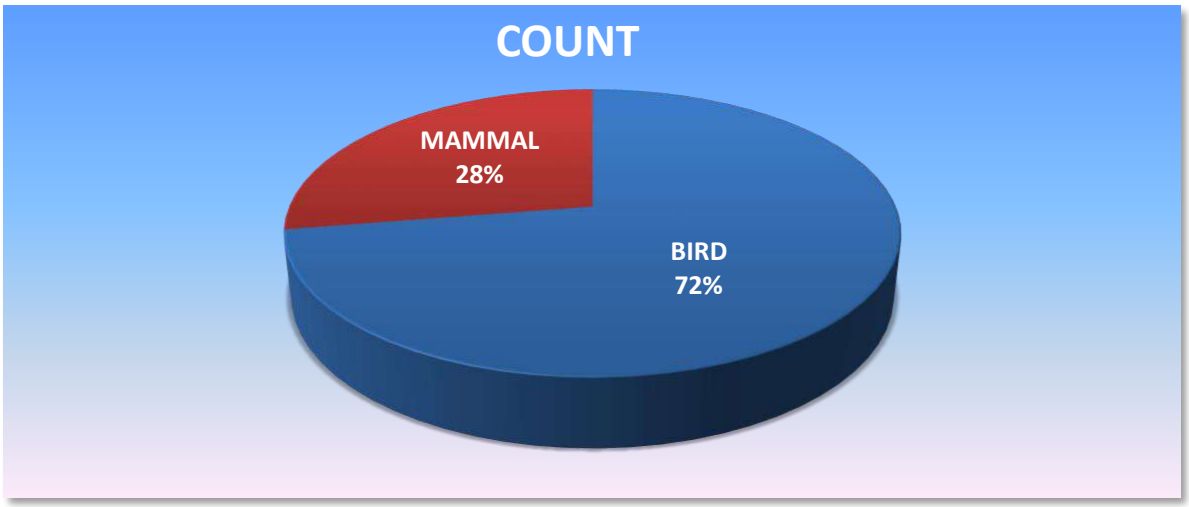
11. Peafowl and peahen	*Pavo cristatus*	14
12. Asian Open -billed stork	*Anastomous oscitans*	9
13. Green Bee eater	*Merops orientalis*	2
14. Red vented bulbul	*Pycnonotus cafer*	6
15. Indian roller	*Coracias benghalensis*	5
16. Rufous treepie	*Dendrocitta vagabunda*	4
17. Rose-ringed parrot	*Psittacula krameri*	3
18. Green junglefowl	*Gallus varius*	12
19. Great Cormorant	*halacrocoracidae aristoteli*	11
20. Indian Pond Heron	*Ardeola grayii*	3
21. Purple Heron	*Ardea purpurea*	3
22. Grey Heron	*Ardea cinerea*	6
Species	***Scientific name***	**Count**
23. Jungle owl	*Glaucidium radiatum*	1
24. Serpent Eagle	*Spilornis cheela*	3
25. Jungle Babbler	*Turdoides striata*	16
26. Grey headed Fish eagle	*Ichthyophaga ichthyaetus*	1
27. Cuckoo	*Cocomantis flabelliformis*	2
28. Yellow Footed Green Pigeon	*Treron phoenicoptera*	5
29. Spotted dove	*Spilopelia chinensis*	6
30. Common starling	*Sturnus vulgaris*	3
31. Grey hornbill	*Buceros bicornis*	2
32. Purple moorhen	*Porphyrio porphyrio*	15
33. Red wattled lapwing	*Vanellus indicus*	4
34. Koyel	*Eudynamys scolopaceus*	3
35. Golden oriole	*Oriolus kundoo*	1
36. Black hooded oriole	*Oriolus xanthornus*	2
37. Spotted-billed duck	*Anus poecilorhyncga*	3
38. Indian Long tailed shrike	*Lanius schach*	1
39. Greater Coucal	*Centropus sinesis*	3
40. Common Tailorbird	*Orthotomus sutorius*	4

41. Woodpecker	*Picidae sp.*	1
42. Eurasian Thick -knee bird	*Burhinus oedicnemus*	2
43. Red spurfowl	*Galloperdix spadicea*	1
44. Little Grebe	*Tachybaptis ruficollis*	1
45. Glossy Ibis	*Plegadis falcinellus*	1
46. Osprey	*Pandion haliaetus*	1
47. House sparrow	*Passer domesticus*	1
48. Shikra	*Accipiter badius*	1
TOTAL OBSERVED:		**221**

Mammalian Fauna

Species	***Scientific Name***	**Count**
1.Spotted deer	*Axis axis*	28
2.Langur	*Semnopithecus entellus*	18
3.Sambar	*Rusa unicolor*	15
4.Barking deer	*Muntiacus muntjak*	2
5. Indian Gaur	*Bos gaurus*	3
6.Dhole	*Cuon alpines*	4
7.Sloth bear	*Melursus ursinus*	3
8.Jackal	*Canis aureous*	1
9.Wild boar	*Sus scrofa*	4
10. Blue bull (nilgai)	*Boselaphus tragocamelus*	2
11.Tiger	*Panthera tigris*	1
12.Tiger cubs	*Panthera tigris*	3
TOTAL OBSERVED		**84**

- **PIE-CHART OF AVIAN AND MAMMALIAN FAUNA COUNTS:**



BIODIVERSITY INDEX

Quantifying the species diversity of ecological communities is complicated. In addition to issues of statistical sampling, the rather arbitrary nature of delineating an ecological community, and the difficulty of positively identifying all of the species present, species diversity itself has two separate components:

>> the number of species present (*species richness*), and

>> their relative abundances (termed *dominance* or *evenness*).

Diversity indicex- This is the measure of the number of species in an area and the relative distribution of individuals among those species. One such diversity index is:

Shannon-Wiener Diversity Index:

The idea behind this index is that the diversity of a community is similar to the amount of information in a code or message. It is calculated in the following way:

$$H' = -\sum\{p_i \times \ln(p_i)\}$$

Where, pi is the proportion of individuals found in species i. For a well-sampled community, we can estimate this proportion as

$$pi = ni/N,$$

where,ni is the number of individuals in species i and N is the total number of individuals in the community.

Since by definition the pis' will all be between zero and one, the natural log makes all of the terms of the summation negative, which is why wetake the inverse of the sum.

The Shannon-Weiner index being a measure of uncertainty,thus measures the diversity of a particular biogeographical region.

Interpretations of the mathematical data provide an insight into the biodiversity distribution of the fauna and hence are reflected by the species richness of the forests under study.

As a part of our endeavours to study the statistical aspect and interpretations of biodiversity, the Shannon-Weiner index of Tadoba-Andhari Tiger Reserve was calculated:

Avian biodiversity Index :

Name	Count	pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190
Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042
Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098

Koyel	3	0.013	-4.299	-0.058
Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149
Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073
Name	**Count**	**pi**	**ln(pi)**	**pi*ln(pi)**
Bulbul	6	0.027	-3.606	-0.098
White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042
Spotted billed duck	3	0.013	-4.299	-0.058
Green bee-eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufous treepie	4	0.018	-3.452	-0.109
Rose- ringed parrot	3	0.013	-4.299	-0.058
Greater coucal	3	0.013	-4.299	-0.058
Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002
Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002
House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thick-knee bird	2	0.009	-4.705	-0.042
Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013

Purple heron	3	0.013	-4.299	-0.058
Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109
Serpent eagle	3	0.013	-4.299	-0.058
Yellow headed fish eagle	1	0.004	-5.398	-0.002
Yellow footed green pegion	5	0.023	-3.788	-0.085
Indian long tailed shrike	1	0.004	-5.398	-0.002
Summed Biodiversity Index (Ha)				**2.766**

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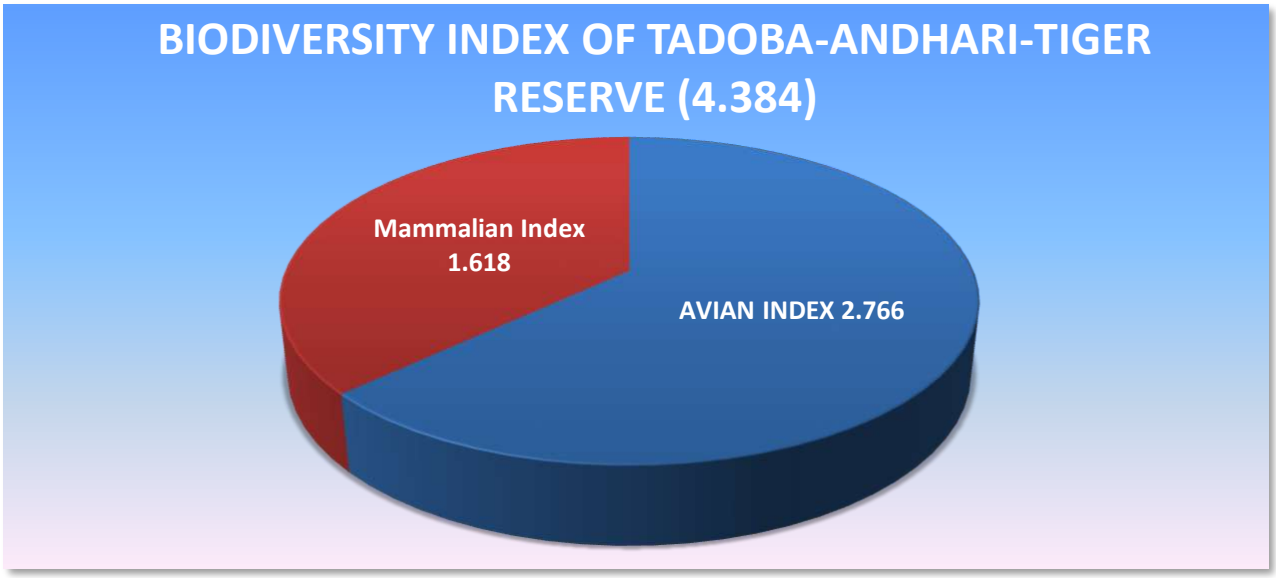
Mammalian diversity Index:

Name	Count	pi	ln(pi)	Pi*ln(pi)
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gaur	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053
Summed Biodiversity Index(Hm)				**1.618**

Biodiversity Index of Tadoba-Andhari Tiger Reserve:

Hm+Ha = 2.766+1.618 =4.384



FAUNAL DIVERSITY: AVIAN DIVERSITY:

Rose-ringed Parrot (*Psittacula krameri)*

Yellow-footed Green Pegion *(Treron phoenicoptera)*

Indian Roller*(Coracias benghalensis)*

Indian long-tailed Shrike(*Lanius schach)*

Black Drongo (*Dicrurus macrocercus)*

Indian Pond Heron (Ardeola grayii)

Peafowl (*Pavo cristatus)*

Black-headed Ibis (*Threskiornis melanocephalus)*

Crested-Serpent Eagle (*Spilornis cheela)*

-: MAMMALIAN FAUNA :-

Tigress Madhuri (*Panthera tigris*)

Sloth Bear (*Melursus ursinus)*

Pug mark of Sloth Bear

Sambar Deer(*Rusa unicolor)*

Langur (*Semnopithecus entellus)*

Spotted Deer (*Axis axis*)

Wild Boar (*Sus scrofa)*

Indian Gaur *(Bos gaurus)*

PITFALL

Pitfall-traps: For Soil-surface-active Invertebrates.

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capture more specific types of insects.

Requirements:

- While carrying out Pitfall Trapping

1. Containers
2. Soap water
3. 70% Ethyl Alcohol
4. Forceps
5. Sterile Gloves
6. Sugar

Methodology:

For the Pitfall traps,four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.
- Soap water was poured into the containers to make the surface slippery and thereby ensuring the avoidance of escape attempts by the captured insect.
- The pitfall trap was allowed to remain intact for about 6 hours. The collected insects were then poured into containers with 70% ethyl alcohol.
- Ethyl Alcohol was used as a preservative for the soft bodied animals as it maintained their elemental composition.

Students collecting samples from Pitfall trap.

Pitfall trap.

Students preparing Pitfall Trap.

BUSH-BEATING

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

Requirements:

1. Umbrella.
2. Stick/Staff.
3. 70% Ethyl Alcohol.
4. Air-tight Containers.
5. Sterile Gloves.
6. Tape.

Methodology:

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

Students performing Bush-beating.

Students performing bush beating and collecting samples.

Students collecting samples after Bush-beating.

QUADRAT-STUDY

Principle:- When an ecologist wants to know how many organizations there are in an particular habitat, it would not be feasible to count them all. Instead he would be forced to count a smaller representative part of the population called sample. Sampling of plants & animals that don't move much(such as snails) can be done by using sampling square called quadrat. A suitable size of quadrate depends upon size of the organisms being sampled. For example to count plants growing on college campus one could use a quadrat with size 0.5to 1 meter in length.

Materials & methods of insects collection :

1. Small garden gloves.
2. Forceps.
3. A kill jar containing 70% alcohol.
4. Insect pins.
5. Ziploc packets & plastic container.
6. Labels.
7. Strings.
8. Wood poles.
9. Magnifying glass.
10. Newspaper for collection .

Methodology:

A suitable site was selected for quadrat work to be done. An area of 1sq was measured & the region was demarcated with the help of string. The string was fixed in square form 1meter*1meter & the corners were fixed with wood poles. Thus the quadrat was formed & various species of flora & fauna were collected with the help of forceps.

Students preparing for Quadrat study.

Students preparing for Quadrat study.

FEW INSECT SAMPLEs COLLECTED FROM PITFALL, BUSH-BEATING, QUADRAT STUDY:

Phylum- Arthropoda

Phylum- Arthropoda

Phylum- Arthropoda

Phylum- Arthropoda

Phylum- Arthropoda

PUG-MARKING

Pug marking is the term used to refer to the footprint of most animals (specially mega fauna). "Pug" means foot in Hindi (Sanskrit –*Padh*; Greek – *Ped*. Every individual animal species has a different pugmark and as such it is used for identification.

IMPORTANCE OF PUGMARK:

- ✓ **Wildlife conservationists are known to catalogue pugmarks in the areas they operate.**
- ✓ **Pugmarks are also for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries, etc.**
- ✓ **It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.**

❖ TO MAKE A PLASTER CAST

➢ MATERIALS:

- **Plaster of Paris (medical quality)**
- **Water**
- **A mug to prepare paste**
- **A strip of thick paper or flexible aluminium.**

Pug mark of Tiger at Tadoba-Andhari Tiger Reserve(Junona Zone).

TIGER AS A KEYSTONE SPECIES

- A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether. A keystone species is often, but not always, a predator.

- Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex species can regulate species abundance, diversity, distribution; which in turn can impact the health of terrestrial habitats.

- Additionally they provide essential food sources for the grazers and remove the sick and weak from population of prey species.

- The decimation of these tiger species can have cascading effects throughout the ecosystem they inhabit, resulting in economically and ecologically devastating consequences.

- In India's Kanha National Park, the keystone species is Tiger and the jewel has been described as "barasinha".

- Tiger is the largest of the world's great cats. Barasinha, gaur, sambar, chital, nilgai help to maintain wildlife population.

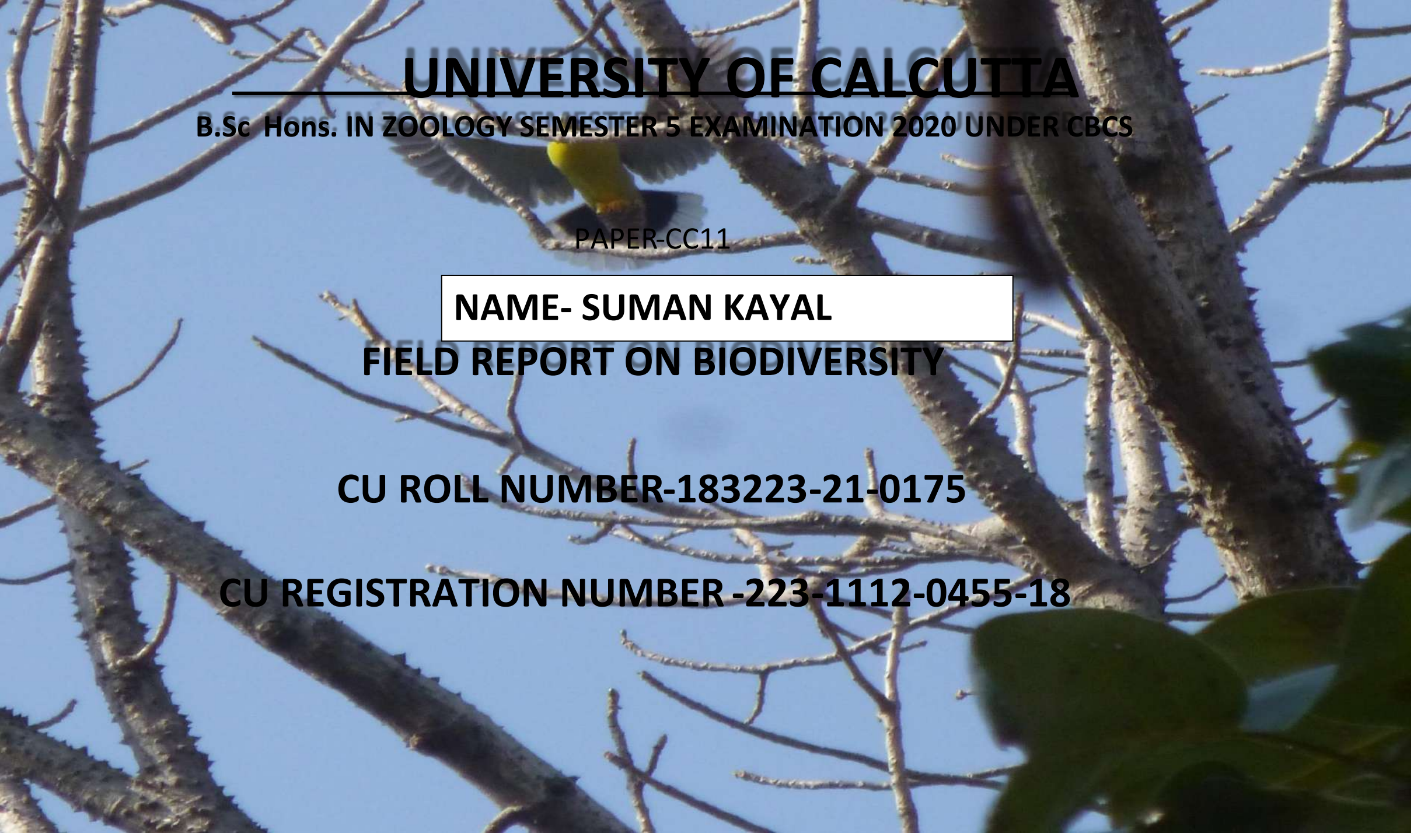
Tigress Madhuri at Tadoba-Andhari Tiger Reserve (Junona Zone).

ACKNOWLEDGEMENT:

I would like to express my heartfelt thanks and gratitude to the Principal of Scottish Church College, Dr. Arpita Mukerji, Vice- Principal, Dr. Supratim Das , HOD of Zoology Dept. Dr. Narayan Chandra Das and to our respected professors of Zoology Department , Prof. Swagata Chattopadhyay, Dr. Samrat Bhattacharya, Dr. Partha Pal, Dr. Aniruddha Chatterjee, Dr. Malini Kundu, who gave us this golden opportunity to accomplish this project , which not only enriched us with a lot of knowledge but also gave us handful of practical experiences .

Secondly, l would also like to thank all my classmates who helped me a lot for successfully completing the field report amidst a deadly pandemic and within a limited time frame . Without everyone's active cooperation I would have never been able to finish this Field Report of our memorable Excursion to Tadoba-Andhari Tiger Reserve.

Date: 14.03.2021.



UNIVERSITY OF CALCUTTA

B.Sc Hons. IN ZOOLOGY SEMESTER 5 EXAMINATION 2020 UNDER CBCS

PAPER-CC11

NAME- SUMAN KAYAL

FIELD REPORT ON BIODIVERSITY

CU ROLL NUMBER-183223-21-0175

CU REGISTRATION NUMBER -223-1112-0455-18

AIM OF EXCURSION

The purpose of Zoological Excursion is to gain a much deeper knowledge about the topics related to the subject such as wildlife, nature and environment with the help of practical demonstration along with theoretical facts. Wjile their purpose is essentially to educate, they can also be a fun bonding experience for everyone involved.

Moreover without practical knowledge, the study of bio-science is incomplete. It also provides a scope to study wildlife and observe animals and their behaviours in their natural habitat.

Hence a zoological excursion helps us to come in close contact with the flora and fauna of various places with different climatic conditions and atmospheric variations and in better understanding of the relaxation between flora and fauna.

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE

Date of Journey :- 23rd February 2020
Train No & Name :- 12860 Gitanjali Express
Departure Time & Place :- 13:40hrs Howrah Station
Reporting Time & Place :- 12:00hrs at Howrah Station New Complex in front of Mail and Express Inquiry

DETAILS of TOUR PROGRAMME

23/02/20:- Start from **Howrah Station** at 13:40 by **12860 Gitanjali** for **Nagpur Station**.

24/02/20:- Reaching **Nagpur Station** at 07:20hrs. Start from **Nagpur Station** at 08:00hrs by Bus for **Tadoba National Park**. Reaching **Tadoba** at 12.00hrs and transfer at Forest **Rest House and Dormitory**.
Afternoon and Evening : Biodiversity specimen collection studies. Night stay at **Tadoba**.

25/02/20:- Morning and Afternoon coverage **Tadoba National Park Safari (Junona and Agarjhari Zone)** by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.
Evening : Biodiversity studies.
Night stay at **Tadoba.**

26/02/20:- Start from **Tadoba** at 08.00hrs by Bus for **Bor**. Reaching **Bor** at 12.00hrs and transfer at **Forest Rest House** and **Dormitories.**
Afternoon and Evening : Biodiversity specimen collection studies.
Night stay at **Bor**.

27/02/20:- Morning and Evening coverage **Bor National Park Safari (Bordharan)** by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.

Evening : Biodiversity studies.

Night stay at **Bor**.

28/02/20:- Start from **Bor** at 06.00hrs by Bus for **Nagpur Station**. Reaching **Nagpur Station** at 09.00hrs. Start from **Nagpur Station** at 10.10hrs by **12129 Azad Hind Express** for **Howrah Station**.

29/02/20:- Reaching **Howrah Station** at 04.15hrs.

The Tour Ends

TADOBA-ANDHARI TIGER RESERVE

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

Location

Coordinates: 20◦10′N 79◦24′E
Total area covered by Tadoba National Park is 116.55 sq.kms.
It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.
The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the Tadoba National Park, created in the year 1955.

Topography

Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges. Densely forested hills form Northern and Western boundary of this area. Elevation of these hills ranges from 200mts to 350mts

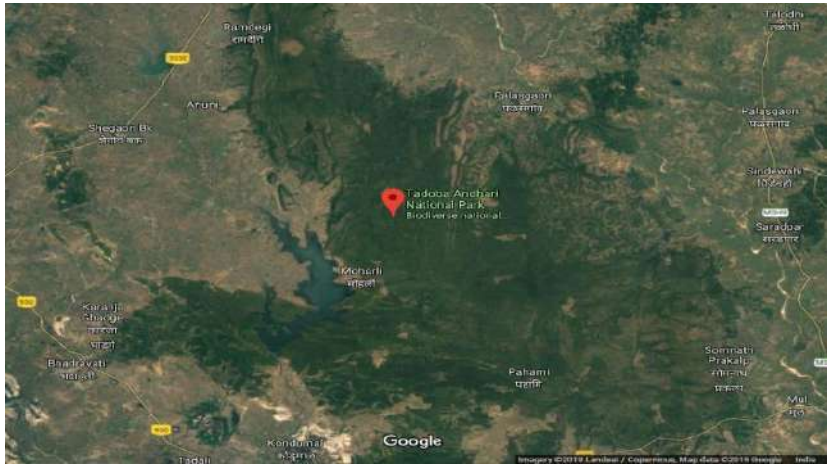
Tadoba lake acts as the buffer between the forest and the extensive farmland which extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

Geography

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smocaves provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari rangesoth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and. The south part of the park is less hilly than the remainder.



Location of TadobaTiger Reserve on map

Location of the accommodation during our trip

To Reach Tadoba National Park

By Air

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities. Best Time to Visit Tadoba

March to May is the best time to see tiger as summer temperatures are extremely high especially in the month of May. The monsoon begins from June to September and Vegetation and insect life come alive with the arrival of monsoon in mid June. The post monsoon starts from October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

Climate and Weather of Tadoba National Park

Winters stretch from November to February and day temperatures is between 25°-30°C and the park is looks green. Summers are too hot in Tadoba as the temperature increases to 47°C; even so it is the ideal time to sight mammals near water lakes as the vegetation is also rare, increasing visibility. The monsoon breaks in June with heavy rainfall of approx.1275 mm. and humidity is around 66%.

GROUP PHOTO AT TADOBA-ANDHARI TIGER RESERVE WITH THE TEACHER IN CHARGE

Safari Zones in Tadoba

The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:

Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

Entry Gates for Safari in Tadoba

There are six gates in the TadobaTiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai, etc. The movement of tourists inside the park is not restricted like in other reserves, therefore one can completely enjoy a jeep safari all over the park. The names of the gates at TadobaNational Park are listed below:

MoharliGate: Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometersaway from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.

Kuswanda:The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.

Kolara Gate: This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.

NavegaonGate: The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.

Pangdi Gate: The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.

Zari Gate: Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

Jeep Safari in Tadoba National Park

The Jeep Safari is the best thing that one can experience in TadobaNational Park. The open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting a tiger and other wild animals are relatively high. The tourists can explore the TadobaPark on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more.

The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where the jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives respectively. A park guide has to accompany the jeep for security purpose. Also, the tourists can enter the park by presenting their personal information and identification papers at the gate and the foreigners by showing their passport in original.

The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

Safari Timing in Tadoba

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Junona Zone, Agarjhari Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period	Morning		Afternoon	
	Entry	Exit	Entry	Exit
25th February 2020	6 .30 AM	10:00 AM	2.30 PM – 4 PM	6.30 PM

BIODIVERSITY

Biodiversity refers to the variety and variability of life on Earth. Biodiversity typically measures variation at the genetic, species, and ecosystem level. Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.

Biodiversity is not distributed evenly on Earth, and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversity is usually highest along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans. There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

TYPES OF BIODIVERSITY:

Genetic Diversity

- Different genes and combinations of genes within populations
- Allows population of a species to adopt to environmental changes

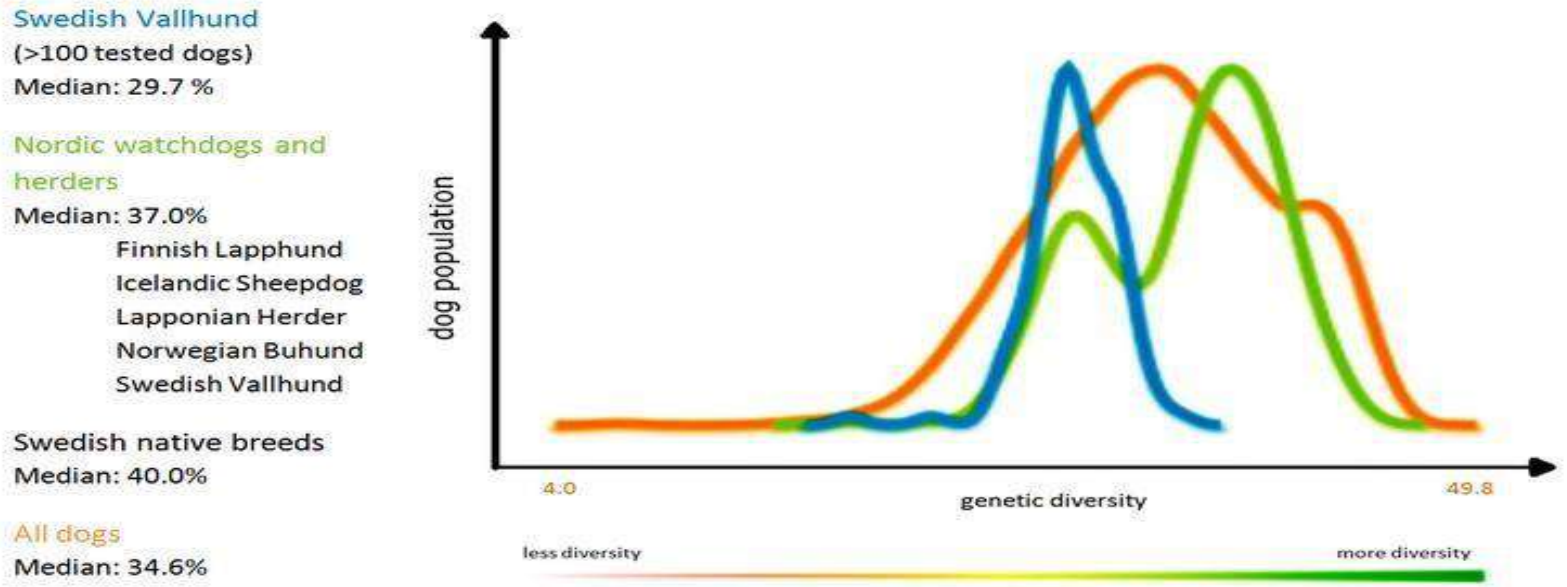


FIG: GENETIC DIVERSITY OF SWEDISH VALLHUND COMPARED TO OTHER BREEDS[1]

Safari Census

We completed a total of 2 safaris in 1 Protected Area, namely, Tadoba-Andhari Tiger Reserve.
We went on all the safaris on Gypsies.

Species	*Scientific Name*	Count
1. Black Drongo	*Dicrurus macrocercus*	6
1. Parakeet	*Psittacula cyanocephala*	4
1. Black headed ibis	*Threskiornis melanocephalus*	7
1. Lesser egret	*Egretta garzetta*	14
1. Lesser whistling duck	*Dendrocygnajavanica*	17
1. Jacana	*Metopidius indicus*	3
1. White eyed buzzard	*Butastur teesa*	2
1. Indian magpie Robin	*Turdus migratorius*	2
1. Common Kingfisher	*Haleyon smyrnesis*	3
1. Blue kingfisher	*Alcedo atthis*	1
1. Peafowl and peahen	*Pavo cristatus*	14
1. Asian Open -billed stork	*Anastomous oscitans*	9
1. Green Bee eater	*Merops orientalis*	2
1. Red vented bulbul	*Pycnonotus cafer*	6
1. Indian roller	*Coracias benghalensis*	5
1. Rufous treepie	*Dendrocitta vagabunda*	4
1. Rose-ringed parrot	*Psittacula krameri*	3
1. Green junglefowl	*Gallus varius*	12
1. Great Cormorant	*Phalacrocoracidae aristotelis*	11
1. Indian Pond Heron	*Ardeola grayii*	3

Tadoba-AndhariTiger Reserve Census:

- Junona zone(Morning Safari) &
- Agarzari Zone (Afternoon Safari)

Avian Fauna

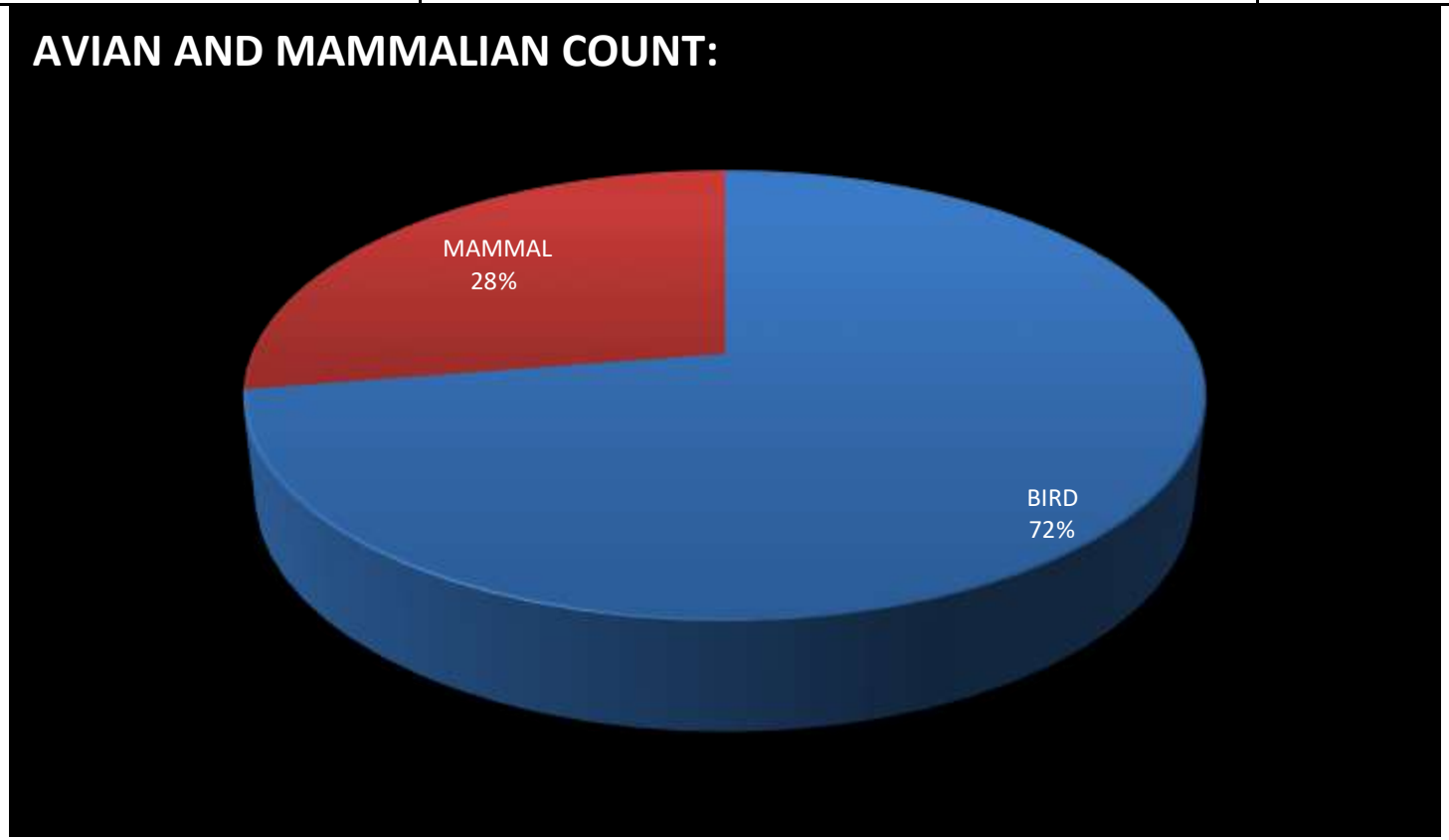
1. Purple Heron	*Ardea purpurea*	3
1. Grey Heron	*Ardea cinerea*	6
Species	***Scientific name***	**Count**
1. Jungle owl	*Glaucidium radiatum*	1
1. Serpent Eagle	*Spilornis cheela*	3
1. Jungle Babbler	*Turdoides striata*	16
1. Grey headed Fish eagle	*Ichthyophaga ichthyaetus*	1
1. Cuckoo	*Cocomantis flabelliformis*	2
1. Yellow Footed Green Pigeon	*Treron phoenicoptera*	5
1. Spotted dove	*Spilopelia chinensis*	6
1. Common starling	*Sturnus vulgaris*	3
1. Grey hornbill	*Buceros bicornis*	2 2
1. Purple moorhen	*Porphyrio porphyrio*	15
1. Red wattled lapwing	*Vanellus indicus*	4
1. Koel	*Eudynamys scolopaceus*	3
1. Golden oriole	*Oriolus kundoo*	1
1. Black hooded oriole	*Oriolus xanthornus*	2
1. Spotted-billed duck	*Anus poecilorhyncga*	3
1. Indian Long tailed shrike	*Lanius schach*	1
1. Greater Coucal	*Centropus sinesis*	3
1. Common Tailorbird	*Orthotomus sutorius*	4
1. Woodpecker	*Picidae sp.*	1
1. Eurasian Thick -knee bird	*Burhinus oedicnemus*	2
1. Red spurfowl	*Galloperdix spadicea*	1
1. Little Grebe	*Tachybaptis ruficollis*	1

1. Glossy Ibis	*Plegadis falcinellus*	1
1. Osprey	*Pandion haliaetus*	1
1. House sparrow	*Passer domesticus*	1
1. Shikra	*Accipiter badius*	1
TOTAL OBSERVED:		**221**

Mammalian Fauna

Species	*Scientific Name*	Count
1.Spotted deer	*Axis axis*	28
2.Langur	*Semnopithecus entellus*	18
3.Sambar	*Rusa unicolor*	15
4.Barking deer	*Muntiacus muntjak*	2
5. Indian Gaur	*Bos gaurus*	3
6.Dhole	*Cuon alpines*	4
7.Sloth bear	*Melursus ursinus*	3
8.Jackal	*Canis aureous*	1
9.Wild boar	*Sus scrofa*	4
10. Blue bull (nilgai)	*Boselaphus tragocamelus*	2

11.Tiger	*Panthera tigris*	1
12.Tiger cubs	*Panthera tigris*	3
TOTAL OBSERVED		84



Mammalian diversity

Name	Count	pi	ln(pi)	Pi*ln(pi)
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gour	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053

Avian diversity

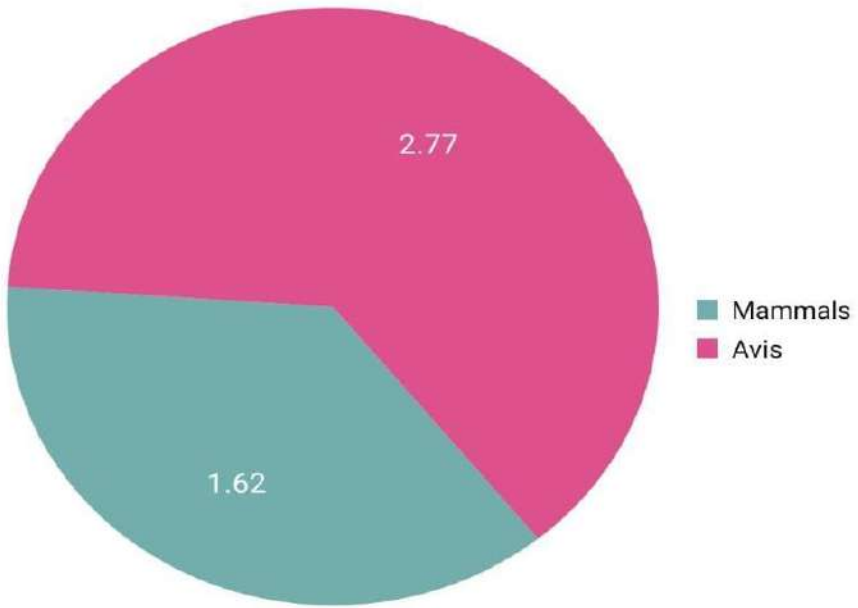
Name	Count	pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190

Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042
Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098
Koyel	3	0.013	-4.299	-0.058
Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149
Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073

Bulbul	6	0.027	-3.606	-0.098
White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042
Spotted billed duck	3	0.013	-4.299	-0.058
Green bee eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufous treepie	4	0.018	-3.452	-0.109
Rose ringed parrot	3	0.013	-4.299	-0.058
Great coucal	3	0.013	-4.299	-0.058
Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002
Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002

House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thickknee bird	2	0.009	-4.705	-0.042
Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013
Purple heron	3	0.013	-4.299	-0.058
Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109
Serpent eagle	3	0.013	-4.299	-0.058
Yellow headed fish eagle	1	0.004	-5.398	-0.002

Yellow footed green pegion	5	0.023	-3.788	-0.085
Indian long tailed shrink	1	0.004	-5.398	-0.002



BIODIVERSITY PIE CHART

INDIAN ROLLER

BLACK HEADED IBIS

ROSE RINGED PARAKEET

PEAFOWL

LESSER EGRET STORK

ASIAN OPENED BILLED

CRESTED SARPENT EAGLE

SHRIKE

INDIAN POND HERON.

COTTON PYGEME GOOSE

WHITE THROATED KINGFISHER

WHITE EYED BUZZARD

YELLOW FOOTED GREEN PIGEON

PIN TAILED DUCK

MAMMALIAN DIVERSITY TADOBA

SLOTH BEAR

TIGRESS MADHURI

BISON

SPOTTED DEER

SAMBAR DEER

INDIAN GAUR

BUSH BEATING

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

- REQUIREMENTS:

- Umbrella
- Stick/Staff
- 70% Ethyl Alcohol
- Air-tight Containers
- Sterile Gloves
- Tape

METHODOLOGY

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

STUDENTS CARRYING OUT BUSH BEATING

PITFALL

Pitfall-traps: For Soil-surface-activeInvertebrates.

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capturemore specific types of insects.

- REQUIREMENTS
- While carryingout Pitfall Trapping
- Containers
- Soap water
- 70% Ethyl Alcohol
- Forceps
- Sterile Gloves
- Sugar

•METHODOLOGY

For the Pitfall traps, four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.
4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.
- Soap water was poured into the containers to make the surface slippery and thereby ensuring the avoidance of escape attempts by the captured insect.

FIG: PITFALL TRAP

STUDENTS CARRYING OUT PITFALL.

STUDY OF QUADRATE

•PRINCIPLE:-

When an ecologist wants to know how many organizations there are in a particular habitat, it would not be feasible to count them all. Instead he would be forced to count a smaller representative part of the population called sample. Sampling of plants & animals that don't move

much(such as snails) can be done by using sampling square called quadrate. A suitable size of quadrate depends upon size of the organisms being sampled. For example to count plants growing on college campus one could use a quadrate with size 0.5to 1 meter in length.

•MATERIALS & METHODS OF INSECTS COLLECTION:-

1. Small garden gloves
2. Forceps
3. A kill jar containing 70% alcohol
4. Insect pins
5. Ziploc packets & plastic container
6. Labels
7. Strings
8. Wood poles
9. Magnifying glass
10. Newspaper for collection

•METHODOLOGY

A suitable site was selected for quadrate work to be done. An area of 1sq was measured & the region was demarcated with the help of string. The string was fixed in square form 1meter*1meter & the corners were fixed with wood poles. Thus the quadrate was formed & various species of flora & fauna were collected with the help of forceps.

STUDENTS CARRYING OUT QUADRATE STUDY

FIG: INSECTS FOUND IN BUSH BEATING, PITFALL AND QUADRATE STUDY

TIGER AS A KEYSTONE SPECIES

- A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether. A keystone species is often, but not always, a predator.
- Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex species can regulate species abundance, diversity, distribution; which in turn can impact the health of terrestrial habitats.
- Additionally they provide essential food sources for the grazers and remove the sick and weak from population of prey species.
- The decimation of these tiger species can have cascading effects throughout the ecosystem they inhabit, resulting in economically and ecologically devastating consequences.
- In India's Kanha National Park, the keystone species is Tiger and the jewel has been described as "barasinha".
- Tiger is the largest of the world's great cats. Barasinha, gaur, sambar, chital, nilgai help to maintain wildlife population.

PUG MARKING

Pug marking is the term used to refer to the footprint of most animals (specially mega fauna). “Pug” means foot in Hindi (Sanskrit –*Padh*; Greek –*Ped*. Every individual animal species has a different pugmark and as such it is used for identification.

•IMPORTANCE OF PUGMARK:

- Wildlife conservationists are known to catalogue pugmarks in the areas they operate.
- Pugmarks are also for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries, etc.
- It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.

•TO MAKE A PLASTER CAST:

- MATERIALS:
- Plaster of Paris (medical quality)
- Water
- A mug to prepare paste
- A strip of thick paper or flexible aluminium.

PUG MARKS OF TIGER

Acknowledgment

I would like to express my special thanks of gratitude to our respected professors Dr. Swagata Chattopadhyay, Dr. Narayan Chandra Das, Dr. Samrat Bhattacharya, Dr. Partha Pal, Dr. Aniruddha Chatterjee, Dr. Malini kundu, Sri Sunil kr Pramanik as well as our principal ma'am Dr. Arpita Mukerji & vice principal sir Dr. Supratim Das who gave us the

golden opportunity to do this wonderful field report , which also helped us in doing a lot of Research and we came to know about so many new things we're really thankful to them. Secondly l would also like to thank all my classmates who helped me a lot in finalizing this report within the limited time frame. Without all these helping hands I'll never be able to finish the field report of our memorable excursion to Tadoba-andhari tiger reserve.

Teacher’s Signature

UNIVERSITY OF CALCUTTA

B.Sc. Honours in Zoology
Semester V Examination- 2020
(Under C.B.C.S.)

PAPER - CC 11
FIELD WORK ASSESSMENT

Name : Susmi Sen
College Roll No. : 18S-701

CU REG. NO. : 223-1211-0387-18
CU ROLL NO. : 183223-11-0102

INTRODUCTION

AIM OF EXCURSION

The purpose of zoological excursion is to gain a much deeper knowledge about the topics related to the subject such as wildlife,nature and environment with the help of practical demonstration along with theoretical facts.While their purpose is essentially to educate,they can also be fun bonding experience for everyone involved. Moreover without practical knowledge,the study of bio-science is incomplete. It also provides scope to study wildlife and observe animals and their behaviours in their natural habitat.

Hence zoological excursions help us to come in close contact with the flora and fauna of various places with different climatic conditions and atmospheric variations and in better understanding of the relation between flora and fauna.

IMPORTANCE OF EXCURSION NOTEBOOK

An outstanding field notebook serves many potential purposes

1.It is a valuable record of what you have seen,heard,discussed and thought about in the field.

2.It may contain the data which will lead to an oral presentation,and/or a thesis.

3.It may be a graded portion of a curve.

4.It may be something you and your relatives will find interesting decades in the future.

FIELD DATA COLLECTION PURPOSE OF FIELD NOTES:

- MONEY: Field books contain data which has been collected over weeks or months.The cost of collecting the data can range in the thousand of dollars.

- LITIGATION:Property surveys are subject to court review.The status of the field book can be a very important factor in litigation.
- EFFICIENCY:The information in the field book is used by office personnel to make drawings or calculations.Complete and correct notes are essential.

BASIC REQUIREMENTS FOR GOOD NOTES

>ACCURACY:By far the most important aspect of field notes.
>INTEGRITY:(complete) if the field crew fails to collect all important data,costly delays can occur in the office.
>ARRANGEMENT:Following a standard note format,save time and money when trying to follow notes.
>LEGIBILITY:Major errors can occur if your notes cant be read easily.
>CLARITY:well planned surveys with clear special notations and sketches will great add to the understanding of the survey.

BIODIVERSITY IS THE KEY OF DIVERSITY

Biodiversity is the most commonly used to replace the more clearly defined and long established terms,species diversity and species richness. Biologists most often define biodiversity as the "Totality of genes,species,and ecosystem of a region".Biodiversity is the degree of variation of life. This can refer to genetic variation,or ecosystem variation within an area,biome,or planet. Terrestrial biodiversity tends to be the highest at low latitude near the equator,which seems to be the result of the warm climate and high primary productivity.

Marine biodiversity tends to be highest along coasts in the Western Pacific,when sea surface temperature is highest and in-latitudinal band in all oceans.Biodiversity generally tends to cluster in hotspots,and has been

increasing through time but will be likely to slow in the future. Rapid environmental changes typically cause mass extinctions.

One estimate is that <1%-3% of that species that have existed on earth are extant. The period since the emergence of humans has displayed ongoing biodiversity reduction and an accompanying loss of genetic diversity. Named the Holocene extinction,the reduction is caused primarily by human impacts,particularly habitat destruction.

Conversely,biodiversity impacts human health in a number of ways,both positively and negatively.

The Limited Nations designated 2011-2020 as the Limited Nations Decade on Biodiversity

TOUR PROGRAMME OF TADOBA NATIONAL PARK AND BOR TIGER RESERVE

Date of Journey :- 23rd February 2020

Train No & Name :- 12860 Gitanjali Express

Departure Time & Place :- 13:40hrs Howrah Station

Reporting Time & Place :- 12:00hrs at Howrah Station New Complex in front of Mail and Express Inquiry

DETAILS of TOUR PROGRAMME

23/02/20:- Start from Howrah Station at 13:40 by 12860 Gitanjali for Nagpur Station.

24/02/20:- Reaching Nagpur Station at 07:20hrs. Start from Nagpur Station at 08:00hrs by Bus for Tadoba National Park. Reaching Tadoba at 12.00hrs and transfer at Forest Rest House and Dormitory.

Afternoon and Evening : Biodiversity specimen collection studies. Night stay at Tadoba.

25/02/20:- Morning and Afternoon coverage Tadoba National Park Safari (Junona and Agarjhari Zone) by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.

Evening : Biodiversity studies.

Night stay at Tadoba.

26/02/20:- Start from Tadoba at 08.00hrs by Bus for Bor. Reaching Bor at 12.00hrs and transfer at Forest Rest House and Dormitories.

Afternoon and Evening : Biodiversity specimen collection studies.

Night stay at Bor.

27/02/20:- Morning and Evening coverage Bor National Park Safari (Bordharan) by Zypsy from 06:00hrs to 10:00hrs and 14:30hrs to 18:00hrs.

Evening : Biodiversity studies.

Night stay at Bor.

28/02/20:- Start from Bor at 06.00hrs by Bus for Nagpur Station. Reaching Nagpur Station at 09.00hrs. Start from Nagpur Station at 10.10hrs by 12129 Azad Hind Express for Howrah Station.

29/02/20:- Reaching Howrah Station at 04.15hrs.

The Tour Ends

ACCOMPANYING PERSONS :-

1. Prof. Swagata Chattopadhyay
2. Sri Sunil Kr Pramanik

TADOBA-ANDHARI TIGER RESERVE

Notably Maharashtra's oldest and largest National Park, the "Tadoba National Park", also known as the "Tadoba Andhari Tiger Reserve" is one of India's 47 project tiger reserves existing in India.

Location

Coordinates: 20◦10′N 79◦24′E

Total area covered by Tadoba National Park is 116.55 sq.kms.

It lies in the Chandrapur district of Maharashtra state and is approximately 150 km from Nagpur city.

The total area of the Tadoba-Andhari tiger reserve is 1,727 Sq.km, which includes the Tadoba National Park, created in the year 1955.

Significance

Tadoba National park contains some of the best forest tracks and is endowed with rich biodiversity. It is famous for its natural heritage. Tadoba is an infinite treasure trove of innumerable species of trees and plants - and wildlife that includes Tigers, Panthers, Sloth Bears, Hyenas, Jackals, Wild Dogs, Bison, Barking Deer, NilGai, Sambar, and Cheatal.

Known for its rich biodiversity, the Tadoba National Park is nothing less than a paradise for wildlife enthusiasts. Owing to the presence of the big cats, the park was announced as the 41st Tiger Reserve of India. Along with the tigers, the park provides a home to the Wild Boar, Leopard, Spotted Deer, Rusty Spotted Cat, Indian Mouse Deer, Sambar, Gaur, Sloth Beer, Four Horned Antelope, Flying Squirrel and so on.

Etymology

The word 'Tadoba' is derived from the name of God "Tadoba" or "Taru," which is praised by local tribal people of this region and "Andhari" is derived from the name of Andhari river that flows in this area

Type of Forest

Tadoba reserve is a predominantly southern tropical dry deciduous forest

Physical Factors

Temperature:

Winters are cold with average temperature from 9 to 25 degree celsius.
Summers are dry and the temperature is between 30 to 45 degrees celsius.

Rainfall:

Tadoba
experiences a humid monsoon with rainfall upto 50 inch.

Topography

Tadoba mainly covers Chimur hills and parts of Moharli and Kolsa ranges. Densely forested hills kiform Northern and Western boundary of this area. Elevation of these hills ranges from 200mts to 350mts
Tadoba lake acts as the buffer between the forest and the extensive farmland which extends upto Iris water reservoir, offering good habitat for Muggar crocodiles to thrive.

Geography

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.

To the southwest is the 120 hectares (300 acres) Tadoba Lake which acts as a buffer between the park's forest and the extensive farmland which extends up to Irai water reservoir. This lake is a perennial water source which offers a good habitat for Muggar crocodiles to thrive. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Tadoba reserve covers the Chimur Hills, and the Andhari sanctuary covers the Moharli and Kolsa ranges. It is bounded on the northern and western sides by densely forested hills. Thick forests are relieved by smooth meadows and deep valleys as the terrain slopes from north to south. Cliffs, talus, and caves provide refuge for several animals. The two forested rectangles are formed of the Tadoba and Andhari ranges. The south part of the park is less hilly than the remainder.

FAUNA:-

Mammals: 65 of the keystone species Bengal tiger, Indian Leopard, Sloth bear, Wild dog, Jackal, Sambar, Gaur, Nilgai, Dhole, striped Hyena, small Indian civet, jungle cats, Indian Bison, Barking Deer, Blue Bull, Spotted Dee, Chausingha, Ratel, Flying Squirrel, Wild Boar, Langur, marsh Crocodile.

Reptiles: Indian python, common Indian monitor. Terrapins, Indian star tortoise, Indian cobra Russel's viper

Birds: 195 species of birds. The grey-headed fish eagle, the crested serpent eagle, the changeable hawk-eagle,the raptors.

Other interesting species include the orange-headed thrush, Indian pitta, crested treeswift, stone curlew, crested honey buzzard, paradise flycatcher, bronze-winged jacana and lesser goldenbacked woodpecker. Warblers and the black-naped blue flycatcher .

74 species of butterflies have been recorded including the pansies, monarch, Mormons and swordtails. Insect species include the endangered danaid egg-fly, great eggfly. Dragonflies, stick insects, jewel beetles and the praying mantis, giant wood spider, red wood, wolf spiders, crab spiders and lynx spiders. The most recent census, carried out in 2012, found that the core area has 43 tigers. There are another 22 tigers in the buffer area, and a further 35 in the area surrounding the park.

people can roam here throughout the year, thus they can be witness to spot the tiger and other opulence wild species along with the beautiful dense forest.

Flora

Bamboo	Bambusa sp.
Ain	Terminalia elliptica
Bija	Pterocarpus marsupium
Haldu	Haldina cordifolia
Salai	Boswellia serrata
Semal	Bombax ceiba
Shisham	Dalbergia sissoo
Bel	Aegle marmelos
Mahua	Madhuca longifolia
Palas	Butea monsperma

Hirda	Terminalia chebula
Tendu	Diospyros melanoxylon
Kusum	Schleichera oleosa
Dhawada	Anogeissus latifolia
Karya gum	Sterculia urens

Safari Zones in Tadoba

The Tadoba Andhari Tiger Reserve is one of the finest places to see Royal Bengal Tigers in India. It can be explored through Jeep Safari, also known as "tiger safari" that offers a wide view of the habitat and a chance to see tigers and other animals in the wild. The reserve is divided into three zones, each having different access gates:

Moharli (Mohurli) Zone: This zone is known for the best tiger spotting and is also popular for offering good accommodation facilities to the tourists. The Moharli Gate is easily accessible from other two zone of Tadoba namely Tadoba Zone and Kolsa Zone.

Tadoba Zone: The Tadoba Zone is popular for offering diverse wildlife and scenic locations to the tourists. It is also accessible from four gates at Moharli, Navegaon, Kolara, and Khutwanda.

Kolsa Zone: The Kolsa Zone is much liked for its striking forest landscapes as the possibilities of spotting the wild animals are relatively lower in this zone. Entry to this zone is possible through gates at Moharli, Pangdi, and Zari.

Entry Gates for Safari in Tadoba

There are six gates in the Tadoba Tiger Reserve that gives access to the wild world consists of animals like tigers, leopards, sloth bear, hyena, jackal, wild dog, sambar, cheetal, langoors, nilgai, etc. The movement of tourists inside the park is not restricted like in other reserves, therefore one can completely

enjoy a jeep safari all over the park. The names of the gates at Tadoba National Park are listed below:

1. **Moharli Gate:** Moharli Gate is the oldest entrance to the park, which is located approximately 180 kilometers away from Nagpur. There is entry of nine vehicles each morning and evening for tiger safari from this gate.
2. **Kuswanda**: The distance between Nagpur and Kuswanda Gate is 140 km and the number of vehicles allowed for tiger safari from this gate are four each morning and evening.
3. **Kolara Gate:** This gate is located at a distance of 120 km from Nagpur and the number of jeeps allowed for tiger safari from this gate is nine each morning and evening hence eighteen rides are available for the tourists in a day.
4. **Navegaon Gate:** The distance from Nagpur to the gate is 140 km. The park authority permits the entry of six vehicles each morning and evening for tiger safari from this gate.
5. **Pangdi Gate:** The distance between Pangdi gate and Nagpur is 250 km and the number of vehicles allowed for tiger safari are two each morning and evening, making it a total number of four rides a day.
6. **Zari Gate**: Zari Gate is located at a distance of 190 km from Nagpur and it allows six vehicles each morning and evening for tiger safari hence twelve rides are available for the tourists in a day.

Jeep Safari in Tadoba National Park

The Jeep Safari is the best thing that one can experience in Tadoba National Park. The open Jeep ride, also known as tiger safari is usually of few hours in the dense reserve, where the chances of spotting a tiger and other wild animals are relatively high. The tourists can explore the Tadoba Park on open jeeps and view the habitat of wild animals like the tiger, leopard, sloth bear, wild dogs, panther, barking deer, wolf, and many more.

The Jeep Safari timings are fixed by the Tadoba Administration in the morning and evening, where kithe jeeps are allowed for excursion only after the registration with the administration. The entry of the Jeep has to be registered at the park gate itself followed by a prescribed charge that has to be paid before making the entry. The park authority has restricted the total number of jeeps to 36 for the morning and evening drives respectively. A park guide has to accompany the jeep for security purpose. Also, the tourists can enter the park by presenting their personal information and identification papers at the gate and the foreigners by showing their passport in original.

The tourists are not allowed to get down the jeep throughout the safari excursion as this might risk their life. In addition, they need to follow set of rules and regulations at the time of tiger safari, which the park guide can explain as he/she is completely aware of that.

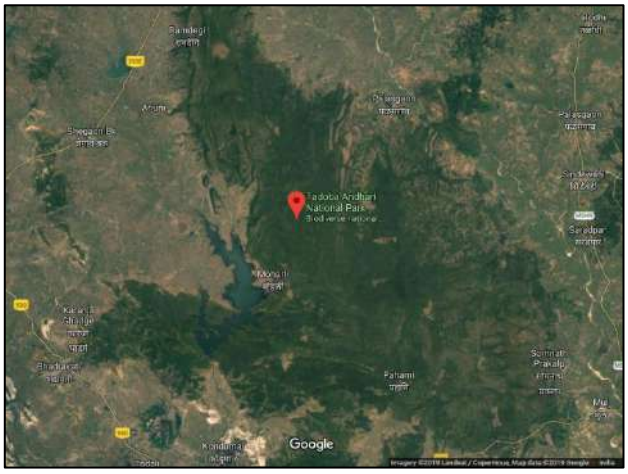
Safari

Group photograph

Safari Timing in Tadoba

The safari in Tadoba Tiger Reserve will give opportunity to explore the rich wildlife of the park and spot the animals like tiger, leopard, wild dogs, sloth bear, etc. There are three zones in the reserve that gives access to the Jeep Safari, namely Moharli (Mohurli) Zone, Tadoba Zone, and Kolsa Zone. The timings of the Jeep Safari for the winter and summer are mentioned below:

Period	Morning		Afternoon	
	Entry	Exit	Entry	Exit
1st Oct to 30th Nov	6 AM - 8 AM	10:00 AM	2.30 PM – 4 PM	6.30 PM
1st Dec to 28th / 29th Feb	6.30 AM - 8.30 AM	11:00 AM	2 PM – 3.30 PM	6:00 PM
1st Mar to 30th April	5.30 AM – 7.30 AM	10:00 AM	3 PM – 4.30 PM	6.30 PM
1st May – 30thJune	5 AM – 7 AM	9.30 AM	3.30 PM – 5 PM	7:00 PM



Location of Tadoba Tiger Reserve on map

National parks in Maharashtra

To Reach Tadoba National Park

By Air

Tadoba National Park is 140 Km away from Dr. Babasaheb Ambedkar International Airport, Nagpur. Regular flights fly from Mumbai, Delhi, Bengaluru, Chennai and Kolkata to Nagpur. Hire taxis or cabs from the airport to reach the park.

By Train

Chandrapur Railway Station is the nearest railhead from the National Park as it is at the distance of 45 Km. Chandrapur railhead is well connected to other major cities like Delhi, Chennai, Hyderabad, Mumbai and Jhansi. Taxis and buses are available from railway station to reach the Tadoba Tiger Reserve.

By Road

Tadoba National Park is at the distance of 45 Km from Chandrapur and 32 Km from Chimur. It is also well connected by road with all major cities.

Best Time to Visit Tadoba

March to May is the best time to see tiger as summer temperatures are extremely high especially in the month of May. The monsoon begins from June to September and Vegetation and insect life come alive with the arrival of monsoon in mid June.

The post monsoon starts from October to November, which is also the best time to visit Tadoba Wildlife Sanctuary as you will feel refreshing viewing the lush green jungle sprawled with flowers. Winter season begins from December to February, though temperature remains quite warm during these months due to the tropical climate.

Climate and Weather of Tadoba National Park

Winters stretch from November to February and day temperatures is between 25°-30°C and the park is looks green. Summers are too hot in Tadoba as the temperature increases to 47°C; even so it is the ideal time to sight mammals near water lakes as the vegetation is also rare, increasing visibility. The monsoon breaks in June with heavy rainfall of approx.1275 mm. and humidity is around 66%.

BIODIVERSITY

Biodiversity refers to the variety and variability of life on Earth. Biodiversity typically measures variation at the genetic, species, and ecosystem level. Terrestrial biodiversity is usually greater near the equator, which is the result of the warm climate and high primary productivity.

Biodiversity is not distributed evenly on Earth, and is richest in the tropics. These tropical forest ecosystems cover less than 10 percent of earth's surface, and contain about 90 percent of the world's species. Marine biodiversity is usually highest along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans.

There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future.

Types of Biodiversity:

1.Genetic Diversity-

- Different genes and combinations of genes within populations
- Allows population of a species to adopt to environmental changes

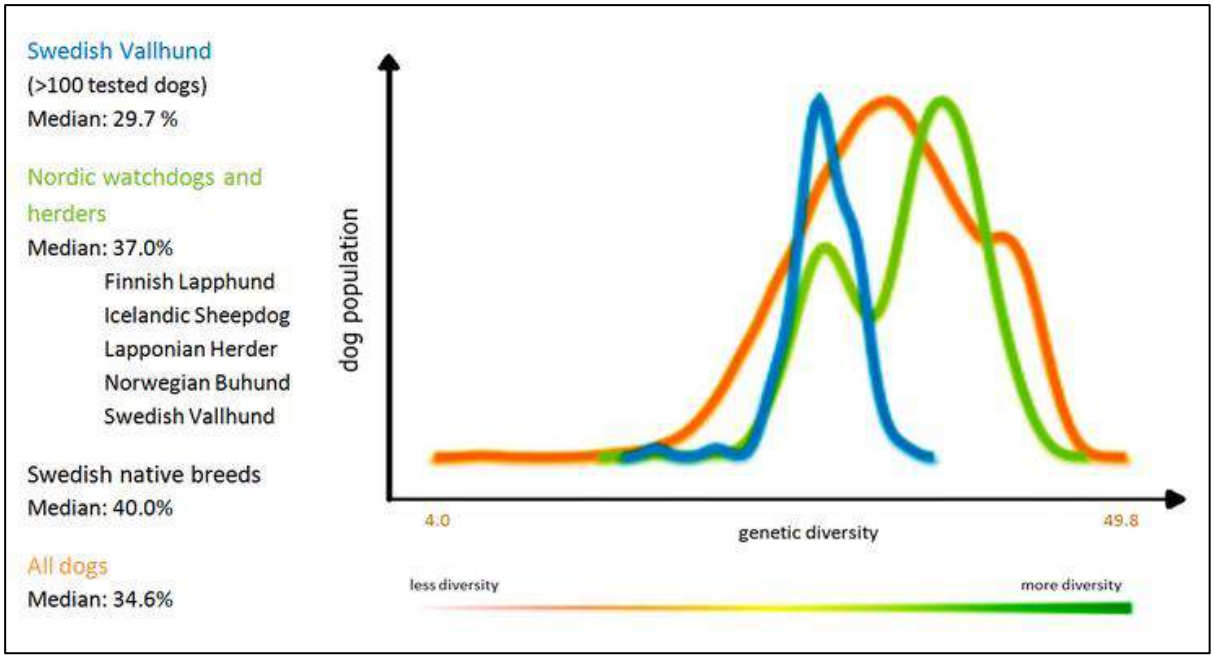


Fig: Genetic Diversity of Swedish Vallhund compared to other breeds[1]

2.Species Diversity-

- Different kinds of organism, relationships among species
- Refers to the number of kinds of species being found

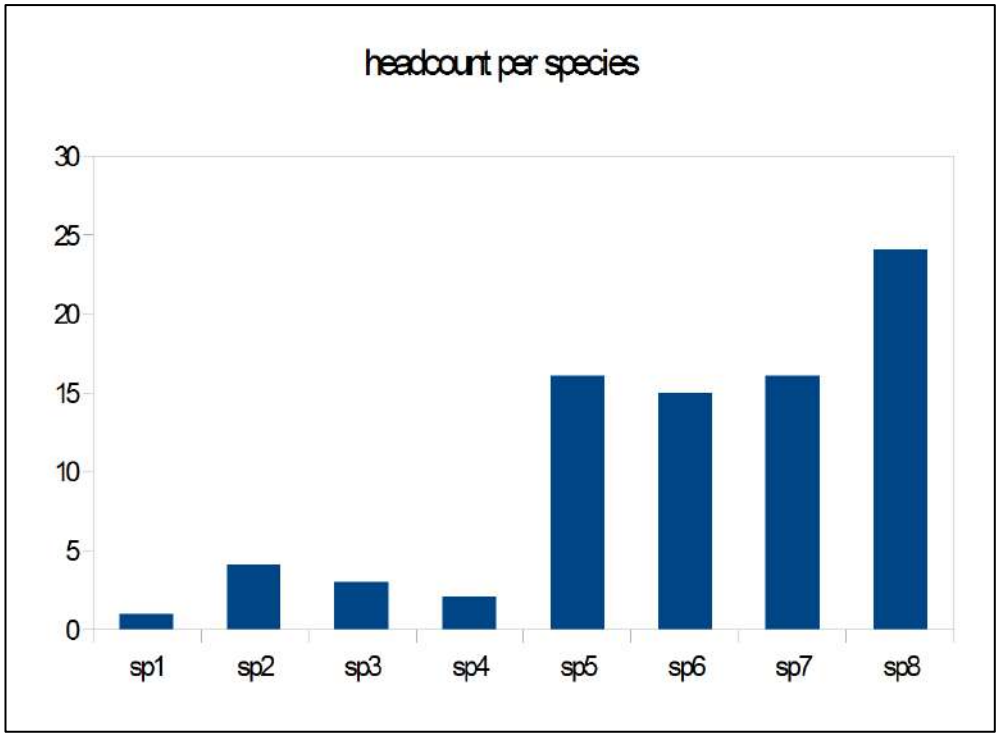


Fig: Fluctuations in species number[2]

3.Ecological Diversity-

- Different habitats, niches, species interactions
- An assemblage of species living in the same area and interacting with an environment

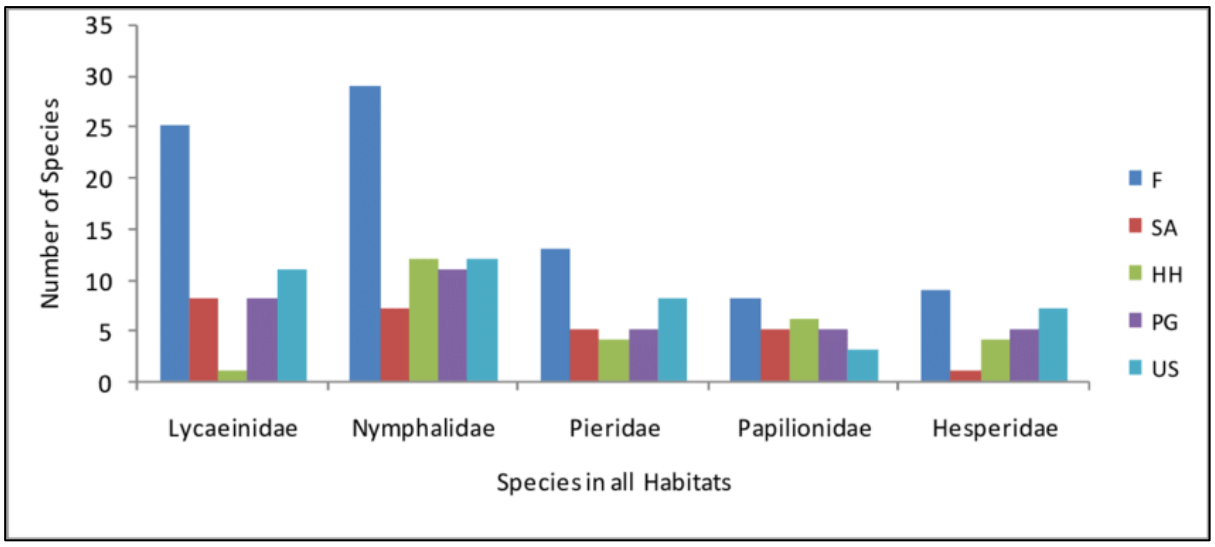


Fig: Species diversity in various Habitats[3]

Safari Census

We completed a total of 4 safaris in 2 Protected Areas, namely, Tadoba Tiger Reserve, Bor Tiger Reserve.

Requirements

1. Notebook and Pen – It was used to keep a note of the species we were able to see and keep a count of them.
2. Binoculars – Olympus Binoculars were used to look far into the depths of the dense forest and high up on the trees to identify the various species, mostly birds, and keep a count.
3. Camera – A Nikon D5200 Digital SLR camera, with a 70-300mm telephoto lens was used to keep photographic evidence of the species observed in their natural habitat.

Safari Census

We completed a total of 2 safaris in 1 Protected Area, namely, Tadoba-Andhari Tiger Reserve.

We went on all the safaris on Gypsies.

Tadoba-Andhari Tiger Reserve Census:

- Junona zone(Morning Safari) &
- Agarzari Zone (Afternoon Safari)

Avian Fauna

Species	*Scientific Name*	Count
1. Black Drongo	*Dicrurus macrocercus*	6
2. Parakeet	*Psittacula cyanocephala*	4

3.	Black headed ibis	*Threskiornis melanocephalus*	7
4.	Lesser egret	*Egretta garzetta*	14
5.	Lesser whistling duck	*Dendrocygnaja vanica*	17
6.	Jacana	*Metopidius indicus*	3
7.	White eyed buzzard	*Butastur teesa*	2
8.	Indian magpie Robin	*Turdus migratorius*	2
9.	Common Kingfisher	*Haleyon smyrnesis*	3
10.	Blue kingfisher	*Alcedo atthis*	1
11.	Peafowl and peahen	*Pavo cristatus*	14
12.	Asian Open -billed stork	*Anastomous oscitans*	9
13.	Green Bee eater	*Merops orientalis*	2
14.	Red vented bulbul	*Pycnonotus cafer*	6
15.	Indian roller	*Coracias benghalensis*	5
16.	Rufous treepie	*Dendrocitta vagabunda*	4
17.	Rose-ringed parrot	*Psittacula krameri*	3
18.	Green junglefowl	*Gallus varius*	12
19.	Great Cormorant	*Phalacrocoracidae aristotelis*	11
20.	Indian Pond Heron	*Ardeola grayii*	3
21.	Purple Heron	*Ardea purpurea*	3
22.	Grey Heron	*Ardea cinerea*	6

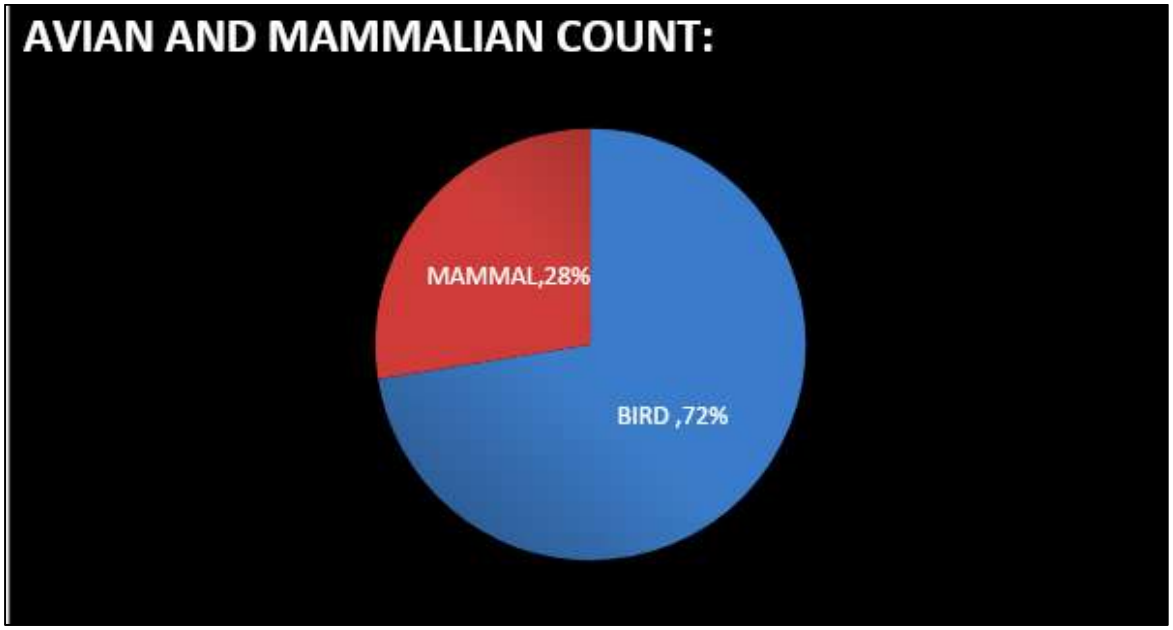
Species	***Scientific name***	**Count**
23. Jungle owl	*Glaucidium radiatum*	1
24. Serpent Eagle	*Spilornis cheela*	3
25. Jungle Babbler	*Turdoides striata*	16
26. Grey headed Fish eagle	*Ichthyophaga ichthyaetus*	1
27. Cuckoo	*Cocomantis flabelliformis*	2
28. Yellow Footed Green Pigeon	*Treron phoenicoptera*	5
29. Spotted dove	*Spilopelia chinensis*	6
30. Common starling	*Sturnus vulgaris*	3
31. Grey hornbill	*Buceros bicornis*	2 2
32. Purple moorhen	*Porphyrio porphyrio*	15
33. Red wattled lapwing	*Vanellus indicus*	4
34. Koel	*Eudynamys scolopaceus*	3
35. Golden oriole	*Oriolus kundoo*	1
36. Black hooded oriole	*Oriolus xanthornus*	2
37. Spotted-billed duck	*Anus poecilorhyncga*	3
38. Indian Long tailed shrike	*Lanius schach*	1

39. Greater Coucal	*Centropus sinesis*	3
40. Common Tailorbird	*Orthotomus sutorius*	4
41. Woodpecker	*Picidae sp.*	1
42. Eurasian Thick -knee bird	*Burhinus oedicnemus*	2
43. Red spurfowl	*Galloperdix spadicea*	1
44. Little Grebe	*Tachybaptis ruficollis*	1
45. Glossy Ibis	*Plegadis falcinellus*	1
46. Osprey	*Pandion haliaetus*	1
47. House sparrow	*Passer domesticus*	1
48. Shikra	*Accipiter badius*	1
TOTAL OBSERVED:		**221**

Mammalian Fauna

Species	***Scientific Name***	**Count**
1.Spotted deer	*Axis axis*	28
2.Langur	*Semnopithecus entellus*	18
3.Sambar	*Rusa unicolor*	15

4.Barking deer	*Muntiacus muntjak*	2
5. Indian Gaur	*Bos gaurus*	3
6.Dhole	*Cuon alpines*	4
7.Sloth bear	*Melursus ursinus*	3
8.Jackal	*Canis aureous*	1
9.Wild boar	*Sus scrofa*	4
10. Blue bull (nilgai)	*Boselaphus tragocamelus*	2
11.Tiger	*Panthera tigris*	1
12.Tiger cubs	*Panthera tigris*	3
TOTAL OBSERVED		**84**



Biodiversity Indices

Biodiversity is one of the primary interests of ecologists, but quantifying the species diversity of ecological communities is complicated. In addition to issues of statistical sampling, the rather arbitrary nature of delineating an ecological community, and the difficulty of positively identifying all of the species present, species diversity itself has two separate components:

1.) the number of species present (*species richness*), and

2.) their relative abundances (termed *dominance* or *evenness*).

As a result, many different measures (or indices) of biodiversity have been developed, such as

1. Shannon index

The idea behind this index is that the diversity of a community is similar to the
amount of information in a code or message. It is calculated in the following way:

$$H' = -\sum\{p_i \times \ln(p_i)\}$$

Where, pi is the proportion of individuals found in species i. For a well-sampled community, we can estimate this proportion as
pi = ni/N,
where, ni is the number of individuals in species i and N is the total number of individuals in the community.
Since by definition the pis' will all be between zero and one, the natural log makes all of the terms of the summation negative, which is why we take the inverse of the sum.

Mammalian diversity

Name	Count	pi	ln(pi)	Pi*ln(pi)
Barking deer	2	0.024	-3.738	-0.089
Sloth bear	3	0.036	-3.332	-0.119
Sambar deer	15	0.178	-1.723	-0.308
Langur	18	0.214	-1.540	-0.330
Wild boar	4	0.047	-3.044	-0.145
Spotted deer	28	0.333	-1.099	-0.366
Indian gour	3	0.036	-3.332	-0.119
Blue bull	2	0.024	-3.738	-0.089
Jackel	1	0.012	-4.431	-0.053

Summed Biodiversity Index:

Hm=(+1.618)

Avian diversity

Name	Count	pi	ln(pi)	pi*ln(pi)
Jungle babbler	16	0.072	-2.626	-0.190
Purple moorhen	15	0.068	-2.690	-0.183
Hornbill	2	0.009	-4.705	-0.042
Egret	14	0.063	-2.759	-0.175
Pond heron	3	0.022	-3.806	-0.085
Open billed stork	2	0.015	-4.212	-0.062
Lesser whistling Duck	17	0.077	-2.565	-0.197
Indian roller	5	0.023	-3.788	-0.085
Black drongo	6	0.027	-3.606	-0.098

Koyel	3	0.013	-4.299	-0.058
Pea fowl& pea hen	14	0.063	-2.565	-0.197
Kingfisher	3	0.013	-4.299	-0.058
Cormorant	11	0.049	-3.000	-0.149

Golden oriole	2	0.009	-4.705	-0.042
Robin	2	0.009	-4.705	-0.042
Dove	6	0.027	-3.606	-0.098
Lapwing	4	0.018	-4.012	-0.073
Bulbul	6	0.027	-3.606	-0.098
White throated kingfisher	3	0.013	-4.299	-0.058
Jungle owl	1	0.004	-5.398	-0.002
Cuckoo	2	0.009	-4.705	-0.042
Spotted billed duck	3	0.013	-4.299	-0.058

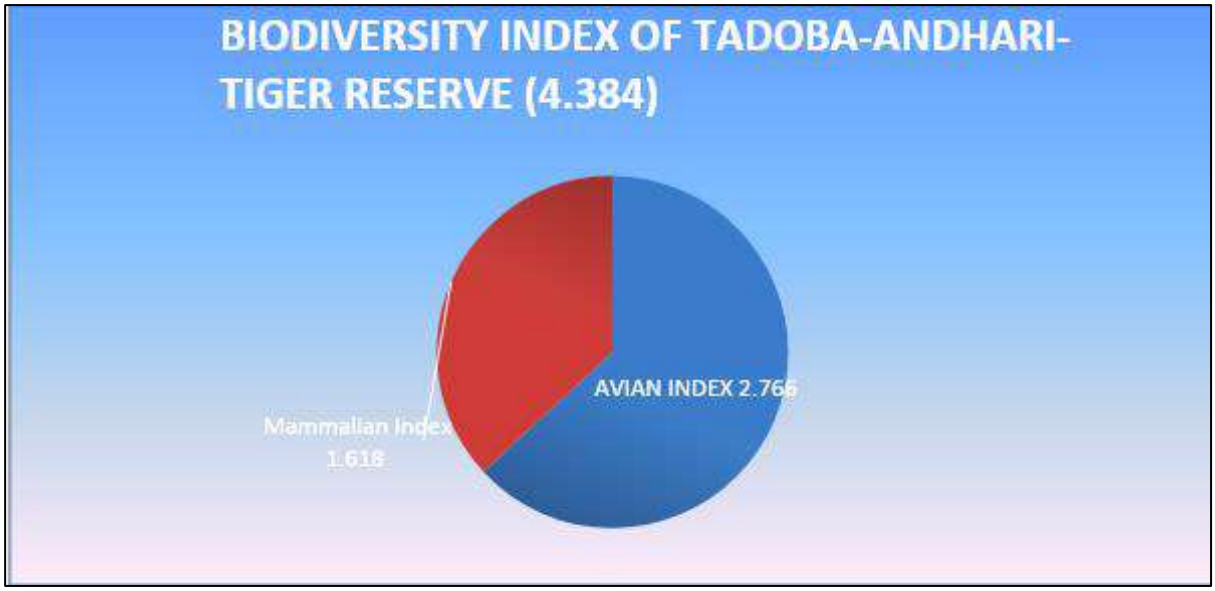
Green bee eater	2	0.009	-4.705	-0.042
Blue kingfisher	1	0.004	-5.398	-0.002
Rufous treepie	4	0.018	-3.452	-0.109
Rose ringed parrot	3	0.013	-4.299	-0.058
Great coucal	3	0.013	-4.299	-0.058
Red spur fowl	1	0.004	-5.398	-0.002
Little grebe	1	0.004	-5.398	-0.002
Glossy ibis	1	0.004	-5.398	-0.002
Osprey	1	0.004	-5.398	-0.002
House sparrow	1	0.004	-5.398	-0.002
Shikra	1	0.004	-5.398	-0.002
Eurasian thickknee bird	2	0.009	-4.705	-0.042

Woodpecker	1	0.004	-5.398	-0.002
Tailor bird	4	0.018	-4.012	-0.098
Jacana	3	0.014	-4.299	-0.058
White eyed buzzard	2	0.009	-4.705	-0.042
Open billed stork	9	0.041	-3.201	-0.013
Purple heron	3	0.013	-4.299	-0.058
Grey heron	6	0.027	-3.606	-0.098
Parakeet	4	0.018	-4.012	-0.073
Black ibis	7	0.032	-3.459	-0.109
Serpent eagle	3	0.013	-4.299	-0.058
Yellow headed fish eagle	1	0.004	-5.398	-0.002
Yellow footed	5	0.023	-3.788	-0.085

green pegion				
Indian long tailed shrink	1	0.004	-5.398	-0.002

Summed Biodiversity Index:

Ha=(+2.766)



Faunal Diversity - Tadoba

Mammalian Fauna

Sloth Bear (*Melursus ursinus*)

Sambar deer *(Rusa unicolor)*

Bison

Tiger (*Panthera tigris*)

Avian Fauna

Fork-tailed Drongo(*Dicrurus adsimilis)*

Indian Roller (*Coracias benghalensis*)

Peacock (*Pavo cristatus*)

Black headed ibis

Quadrate Study

Principal: When an ecologist wants to know how many organisms there in a particular habitat , it would not be feasible to count them all . Instead , he or she would be forced to count a small representative part of the population , called a sample . Sampling of plants or animals that do not move much (such as nails) , can be done using a sampling square called a quadrat . A suitable size of a quadrat depends on the size of the organisms being sampled . For example , to count plants

growing on a school field , one could use a quadrat with sides 0.5 or 1 meter in length.

Setting for Quadrate

Materials & methods of Insect Collection:

-Materials Used

1.Small Garden Shovels

2.Forceps

3.A kill jar containing 70% alcohol

4.Insect pins

5.Zipback packers & plastic containers

6.Labels

7.String

8.Iron poles

9.Magnifying glass

10.Newspaper for collection

Methodology:

A suitable site was selected for the quadrate work to be done. An area of 1sq m was measured and the region was demarcated with the help

of a string . The string was fixed in a square form of 1mX1m and the corners were fixed with iron poles . Thus the quadrat was formed and various species of flora and fauna were collected with the help of forceps.

Bush beating

This is a manner of studying all the insects, flies, spiders and other organisms which mainly reside in the hidden branches of bushes and small trees and shrubs. Many organisms, mostly the butterflies and insects, take refuge inside these plants either for protection, or for preys. A careful study of these organisms gives us a vivid idea on the faunal diversity of that place.

Requirements:

Umbrella
Stick/Staff
70% Ethyl Alcohol
Air-tight Containers
Sterile Gloves
Tape

Methodology

All the bushes and small trees around the place were shaken vigorously and beaten with a stick, one at a time, while simultaneously spreading out the umbrella below the bushes, so that the insects on being dislodged from the bushes, may be trapped immediately in the umbrella.

The insects were then stored in air tight containers containing 70% ethyl alcohol to maintain their tissue integrity and serve as a conservative.

Bush beating

Pitfall

Pitfall-traps: For Soil-surface-active Invertebrates

Pitfall traps were used to survey populations of invertebrates active at the soil surface (after Luff, 1996) and consisted of 6 cm diameter plastic cups, sunk in the ground with the cup-lip level with the soil surface.

There are many variations of pitfall traps, but in its most basic form, a pitfall trap consists of some type of cup or other container (gallon bucket, for example) that is submerged in the soil and partially filled with a preservative. Insects and other organisms crawling about on the ground simply walk into the container and then cannot get out. Pitfalls can be covered to help prevent excessive rain from overflowing the cup, they can have guide vanes that may help guide organisms into the cup, and they may be baited to capture more specific types of insects.

Requirements

- While carrying out Pitfall Trapping

1. Containers
2. Soap water
3. 70% Ethyl Alcohol
4. Forceps
5. Sterile Gloves
6. Sugar

Methodology

For the Pitfall traps, four holes were dug at a distance of one meter from one another forming the four corners of a quadrant.

4 similar containers were placed in the holes with their rims at level with the soil surface to ensure maximum and efficient capture of the surface invertebrates. Following ways were employed:

- Sugar was scattered around the entire circumference of the containers to attract ants and other insect.
- Soap water was poured into the containers to make the surface slippery
- and thereby ensuring the avoidance of escape attempts by the captured insect.
- The pitfall trap was allowed to remain intact for about 6 hours. The collected insects were then poured into containers with 70% ethyl alcohol.
- Ethyl Alcohol was used as a preservative for the soft bodied animals as it maintained their elemental composition.

Setting of Pitfall Trap

Pitfall Trap

Specimens found

TADOBA

TIGER AS A KEYSTONE SPECIES

Ø A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist all together. A keystone species is often, but not always, a predator.

Ø Tiger is an important keystone species in a terrestrial ecosystem. Tiger as apex predator can regulate species abundance, distribution, diversity; which in turn can impact the health of terrestrial habitats.

Ø Additionally they provide essential food sources for the grazers and remove the sick and weak from the population of prey species.

Ø The decimation of these important tiger species can have cascading effects throughout the ecosystems they inhabit, resulting in economically and ecologically devastating consequences.

Ø In India Kanha National Park, the keystone species is Tiger and the "jewel" has been described as Barasingha.

Ø Tiger is the largest of the world's great cats. Barhasinha, gaur, sambar, chital, nilgai help to maintain wildlife population.

1. **Pug marking:**

Pugmark is the term used to refer to the footprint of most animals (especially mega fauna). "Pug" means foot in Hindi (Sanskrit 'padh'; Greek 'ped'). Every individual animal species has a distinct pugmark and as such this is used for identification.

Importance of Pugmark:

A. Wildlife conservationists are known to catalogue pugmarks in the areas they operate.

B. Pugmarks are also used for tracking rogue animals which may be a danger to mankind or even to themselves because of injuries etc.

C. It is possible to make an accurate identification of species, sex, age and physical condition of an animal by those trained in the field.

To make a plaster cast:

Ø Materials:

I. Plaster of Paris(medical quality).

II. Water.

III. A mug to prepare paste.

IV. A strip of thick paper or flexible aluminum.

ACKNOWLEDGEMENT

We would like to extend our gratitude to our respected Principal Dr.Arpita Mukherji,our respected vice Principal,Dr.Supratim Das,our Head of the department Dr. Narayan Chandra Das,our accompanying professor Dr. Swagata Chattopadhyay and Mr. Sunil Pramanik,alongside to all the professors in our department,who have all helped us all along,immensely.We are highly indebted to them for such an enriching experience that the college heads have solely arranged for the betterment of quality

of learning for the students.It has been a marvellous opportunity to observe and learn amidst the inherent wonders of nature. This excursion has helped all of the classmates to work better as a team and we could all broaden our horizons in terms of ecological survey.

Date of submission : 15/03/2021

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