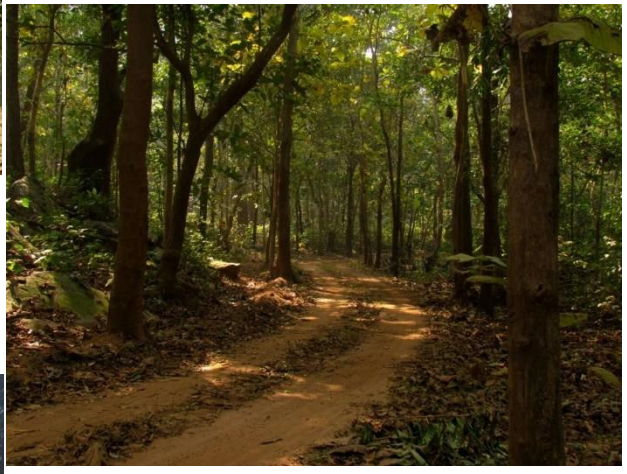
A FIELD REPORT ON THE EDUCATIONAL EXCURSION TO PANCHALINGESWAR, KULDIHA FOREST AND CHANDIPUR, ODISHA, ORGANISED BY THE DEPARTMENT OF ZOOLOGY



ACKNOWLEDGEMENTS

The cheerful presence of several in the Panchalingeswar, Kuldiha forest and Chandipur has filled our mind with full of enthusiasm and freshness. For the exciting study trip, I express my heartiest gratitude to Dr. Mohua Guha, Dr. Shamoa Sarkar, Dr. Sutirtha Sarkar and Prof. Saswati Biswas for their continuous encouragement and guidance. It was impossible for me to successfully complete the field study and report without their guidance and inspiration.

I am thankful to Sri. Prasanta Ghosh for his support during the field study, thanks are also due to all my batch mates of our department, my friends and family members for their continuous support.

INDEX

INTRODUCTION

For the sake of conservation of an ecosystem knowledge and understanding of the biotic and abiotic factors are essential. As students of Zoology we need to understand the geographical distribution of different animals, their relation with the respective habitats and possible threats to the ecosystem, and for that we need to study the biodiversity of a certain area of interest. To study the biodiversity in its all aspects, we need to visit areas which are full of diverse flora and fauna, for knowing and gathering information about surrounding animals and plants. People have to travel long distance in the midst of the nature and this is how the notion of the excursion i.e. field study has been emphasized, It is a good way to enrich our knowledge about the distribution of different species throughout the globe and to break free from shackle of theoretical learning. Not only that we can learnthe facts about animals, but also we can gather a lot of information regarding the biodiversity as well as biogeography of the particular space.

OUR EXPEDITION

On the appointed day of 12th January, 2018 we all assembled at Santragachi station at 5:30 a.m and we all reached to Howrah station at 6:30 a.m. Then we got up Howrah-Secunderabad Falaknuma Express at 7:25 a.m under the leadership of Dr. Mohua Guha, Dr. Shampa Sarkar, Dr. Sutirtha Sarkar and Prof. Saswati Biswas.

At Howrah station we felt much excited and joyful but as the train left the station, for a moment, we had a feeling of depression as had to leave our parents, friend and relatives. Very soon we could overcome the situation. During the train journey, we had enjoyed a lot with classmate and teachers. I am very excited and enjoyed every single moment during this train jouney with my friends bi placing cards, Singing.

We reached at Balasore station on the same day(12.01.2018) at 10:35 a.m. Then, our journey started for Panchalingeswar in cars. The beauty on either side was really exciting particularly to us who have got the opportunity of having visit to this region first time. We reached the lodge at 12:35 p.m and 8 rooms were booked in lodge. After taking lunch, we visited Panchalingeswar temple and did quadrat study and collected water sample for analysis of free CO_2 and O_2.Night stay at Panchalingeswar.

The next day, after taking breakfast, we started our journey to visit Kuldiha forest. We reached the target place at 11 a.m and did quadrate study. Then we went to Chandipur and reached at 3:00 p.m. Then we visited the sea beach and collected water sample for analysis of free CO_2 dissolved O_2.

PERTICIPANTS

Teachers:

- Dr. Mohua Guha
- Dr. Shampa Sarkar
- Dr. Sutirtha Sarkar
- Prof. Saswati Biswas

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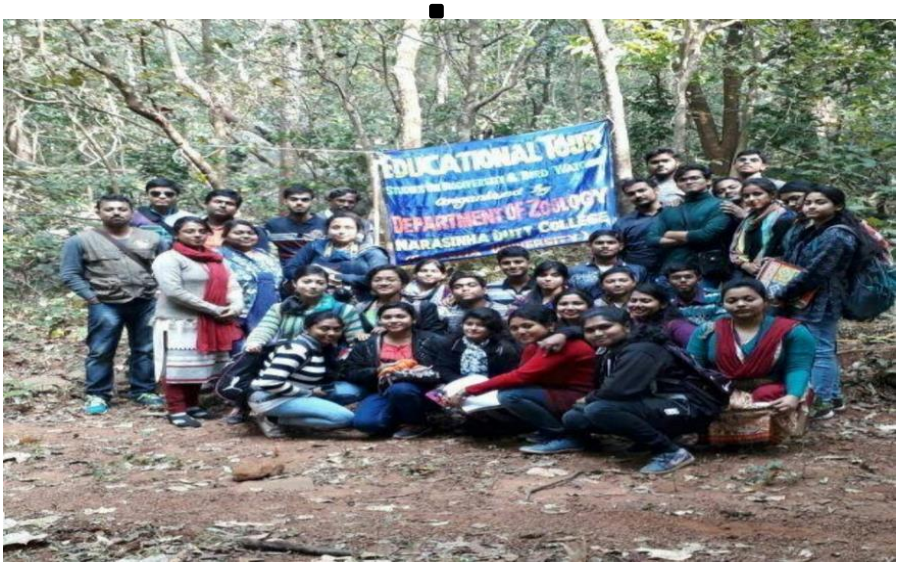
- Pratyay Dhang
- Rounik Karmakar
- Himon Samanta
- Prodipto Das
- Atanu Panja
- Pratyay Paramanick
- Arkaprava Dhawa
- Dip Maji
- Soumyo Maji
- Sayan Hazra



WHAT IS EXCURSION?

An excursion is a trip usually made for educational purpose. The aim of excursion is to study geographical peculiarities, biodiversity composition of a certain place. In addition travelling as a team, visiting new places, meeting new people, experiencing wildlife brings such memorable moments in a student's life that molds the pupil's mind in the right way.

AIM OF EXCURSION

To know the unknown and to see the unseen – is the eternal curiosity of human beings. This curiosity is to be fulfilled by a pleasurable trip to the heart of wilderness.

At Zoological excursions travel and learning go hand in hand. The world becomes our classroom and the lifeless black letters printed in our textbooks come alive in front of our eyes. Excursion is an essential part of education which increases and supplements our knowledge.

AIMS OF THE FIELD STUDY

Aims of the field study are as follows:-

- It is first-hand knowledge for a student to learn the basis of bio-diversity.
- To provide a general idea about a forests eco-system bio-diversity and understanding it's all aspects.
- Enable a student to know about the particular habitat and niche of concerned animal.
- Our primary object is to access bio-diversity of the forests.
- To understand the prevailing ecosystem and ecological harmony.
- To study about various aspects of a particular forests, especially the flora and fauna and prevailing vegetation.
- To observe various species, subspecies, their diversity, habitat, habit, ethology and of course their interpretation.
- To study the ethological aspect of a particular species.
- To know the wilderness from its closer proximity.
- To give an idea about the breeding season of the organisms.
- To know about conservatory measures taken in the protected areas.

WHY STUDY BIODIVERSITY?

Even though we have come a long way from the crude caves in deep forests to sky scrapers in concrete jungles, we cannot really boast of being a step ahead in competing with nature. We have made some serious alterations in our natural surroundings so as to suit our basic requirements and some of these alterations have backfired on us in a drastic manner from flash floods to landslides, we have had quite a few lessons to learn. But we seem to be more comfortable turning a blind eye towards them. Those who ask what difference would the extinction of a species or to make don't quiteunderstand the importance of biodiversity in an ecosystem. The fact is that all the species of flora and fauna, including humans, are dependent on each other and the extinction of any one of these species trigger a domino effect on the other species, which are directly or indirectly dependent on it. For instance, the extinction of the apex predator of a particular biome is bound to result in severe depletion of the vegetation cover here as the number of herbivores will increase due to lack of predators to curb their growth. When we talk about biodiversity importance, even those miniscule organisms which we can't see with our naked eye play a crucial role in smooth functioning of ecosystem. For instance, a basic requirement for plant growth, nitrogen, is produced by the nitrogen fixing bacteria in the soil. If these bacteria species became extinct, the plants will have no nitrogen to grow and this will result in the devastation of the agricultural sector. Wild animals encroach upon human habitation owing to loss of habitat and scarcity of food, both of which are caused as a result of human encroachment in their natural habitat.

At the end of the day, biological diversity is undoubtedly one of the most important components of the ecosystem. That being said is on us to understand the importance of biodiversity conservation, and implement wildlife conservation measures to save our ecosystem. A rubber banned tends to stretch as long as we pull it, but there comes a point of time when it snaps and hurts our own hand. The behaviour of nature is not much different and the more we try to stretch it, the more severe will be its impact on our lives when it snaps.

IMPORTANCE OF BIODIVERSITY

Biodiversity brings enormous benefits to mankind from direct harvesting of plants and animals for food, medicine, fuel, construction materials and other uses to aesthetic, cultural, recreational and research values.

Benefits to ecosystems include climate and water regulation; the creation and protection of soils helping to reduce floods and soil erosion, shoreline protection and providing natural controls of agricultural pests, all of which promote creative evolution.

BIOGEOGRAPHIC ZONES OF INDIA

Biogeography is the study of geographical distributions of organisms, their habitats and the environmental factors that produce them. Biogeographic classification of India was done by Rodgers and Panwar (1988). Within India the classification recognizes 10 zones, divided into 26 provinces.

environmental factors that produce them. Biogeographic classification of India was done by Rodgers and Panwar (1988). Within India the classification recognizes 10 zones, divided into 26 provinces.

Biogeographic zones of India are:

1. Trans-Himalaya with 2 provinces
2. Himalaya with 4 provinces
3. Indian desert with 2 provinces
4. Semi-Arid Zone with 2 provinces
5. Western Ghats with 2 provinces
6. Deccan Peninsula with 5 provinces
7. Gangetic Plain with 2 provinces
8. Coasts with 3 provinces
9. North East India with 2 provinces
10. Islands with 2 provinces

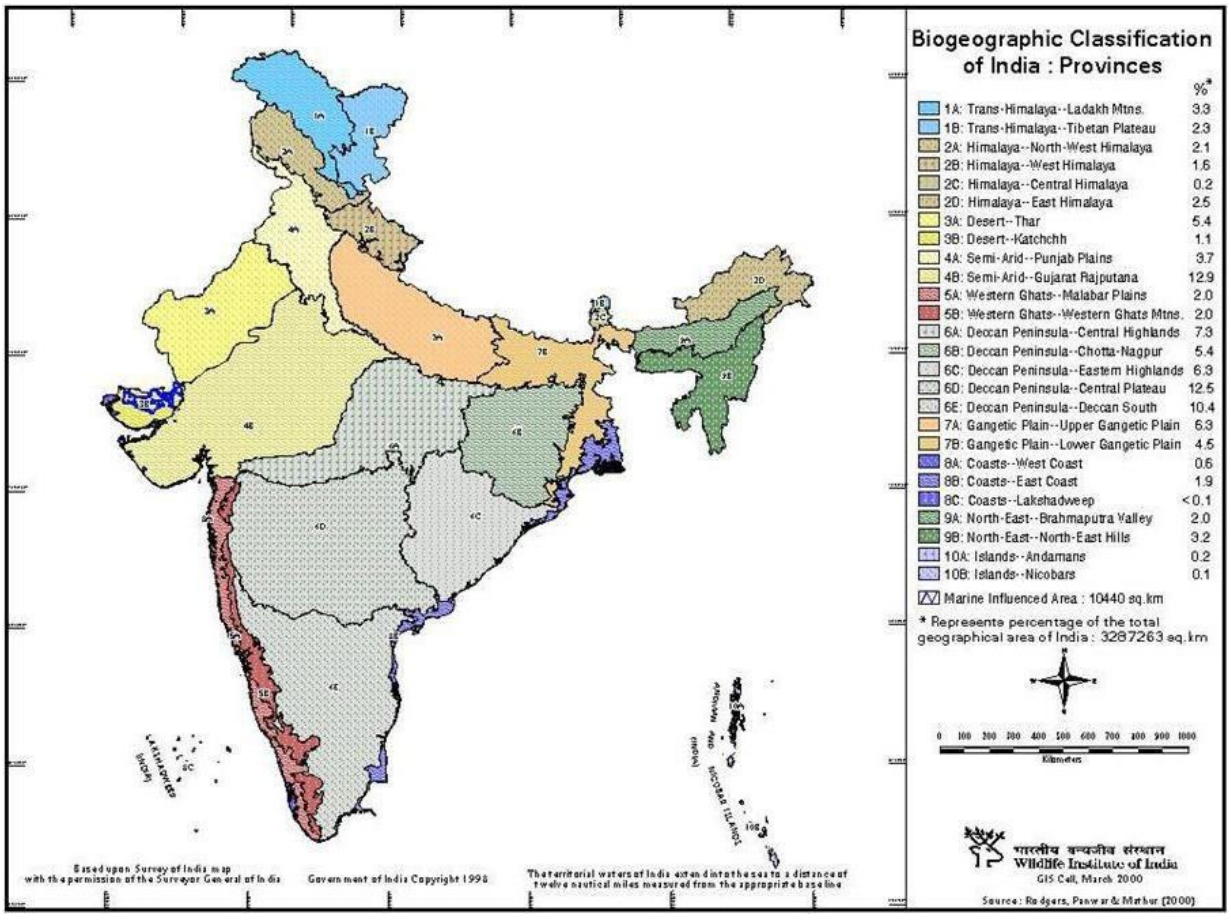


Fig: Biogeographic Classification Rodger, (Panwar and Mathur, 2000) of India

STUDY OF BIODIVERSITY

Introduction:-

Biodiversity is a contraction of the term biological diversity. Diversity is a concept that refers to range of variation or differences within some set of entities. The term biodiversity, therefore, refers to describe the number, variety and variability within living organisms on the earth.

Definition:-

Biodiversity refers to the variability among living organisms from all sources including terrestrial, marine, other aquatic systems and the ecological complexes of which they are a part. This includes biodiversity within species, between species and of ecosystems on our planet – the earth.

History:-

The term biodiversity was coined by Walter.G.Rosen in 1985,in national forrm on biodiversity,held in Washington D.C,in 1986.The proceeding of that forrm were edited by socio-biology Edward O Willson,1988 rnder the title biodiversity.

Levels of biodiversity:-

The ecologists have defined biodiversity at three levels. They are:-

1. Species diversity
2. Genetic diversity
3. Ecosystem or habitat diversity

1. Species diversity:-

Species diversity refers to the diversity of species on the globe from the familiar plants and animals to the less conspicuous fungi, bacteria, protozoans and viruses. They are the fundamental unit of biodiversity.

Features:

i. Distribution of species is not uniform across the globe, they vary from one place to another, such as, tropical rain forests have very high species diversity.
ii. Species diversity has two components:-

a. Species richness:- Number of different species in an area.

b. Species evenness:- It is a measure of the taxa distribution of individuals among total species occupying a given area.

2. Genetic diversity:-

This represents the variation in the genetic composition of individuals within and among species. The differences present either in alleles, in entire genes or in chromosomal structures.

Features:-

i. Genetic diversity is the basis of the variety of life on earth.
ii. A species with more genetic diversity has an increased potential for evolution and has a greater potential for survival.

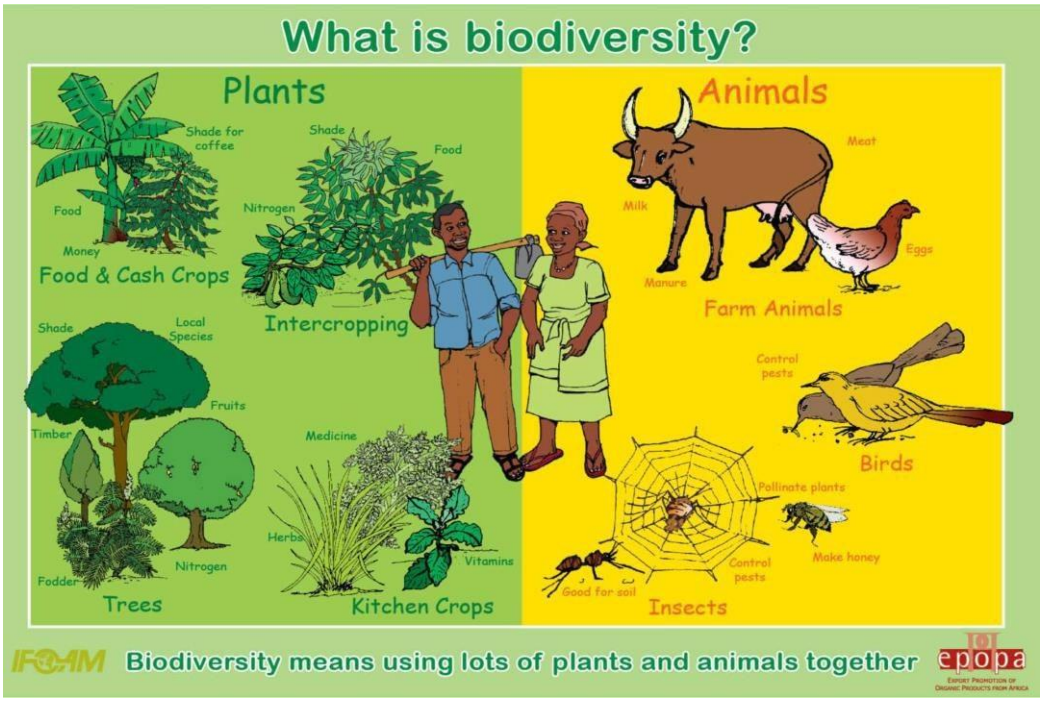
3. Ecosystem or Habitat diversity:-

Habitat diversity refers to the great variety of ecosystems which make up the habitats or communities, in which the organisms live.

Features:-

i. It describes the number of niches, tropic levels, and various ecological processes that sustain energy flow, food webs and recycling of nutrients.

ii. It depends on the physical characteristics of the environment, diversity of species present and the interaction of species between each other and with their physical environment.



 # Note:

When genetic biodiversity increases than both diversity increases.

GENERAL NOTE ON ECOSYSTEM

ECOLOGY: Ecology is the scientific study of the relation of living organism with each other and their surrounding. Ecosystem is defined by web, community or network of individuals that arrange into a self-organized and complex hierarchy of pattern and process. Ecosystem create a biophysical feedback between living (biotic) and non-living (abiotic) components of an environment that generates and regulates the biogeochemical cycles of the planet. Ecosystem provide goods and services that sustain human societies and general well-being. Ecosystem are sustained bi biodiversity within them. Biodiversity is the full-scale of the life and its processes, including genes, species are arrangement of types, forms and interaction the word "ecology" was coined in1866 by the German scientist Ernst Haeckel.

FOOD CHAIN: The sequential inter-linking of organisms involving transfer of food energy from the producers, through a series of organisms with repeated eating and being eaten is referred as "food chain". The biotic components of the ecosystem are linked to each other through food chain. In a typical food chain, producers are at the bottom and their role is to provide food for rest of the community utilizying solar energy. Other organisms belongs to the consumers and finally decomper are present at the bottom to recycle the organic content. In this manner, a nutritive interaction relationship exist between the living organisms of an ecosystem. It is always straight and always follow progressive straight line. The flow of energy is also unidirectional, from sun to producer and then different series of consumers. In a typical food chain, there are always 4 or 5 trophic level in the food chain. The distinct sequential steps in the straight food chains are referred as different trophic levels. For ex. Green plants stand at the first trophic level; the herbivorous are the second trophic level; and flesh eaters represent the third trophic levels. The position of plant is at the bottom but the position of other organism varies to different trophic level in different food chains.

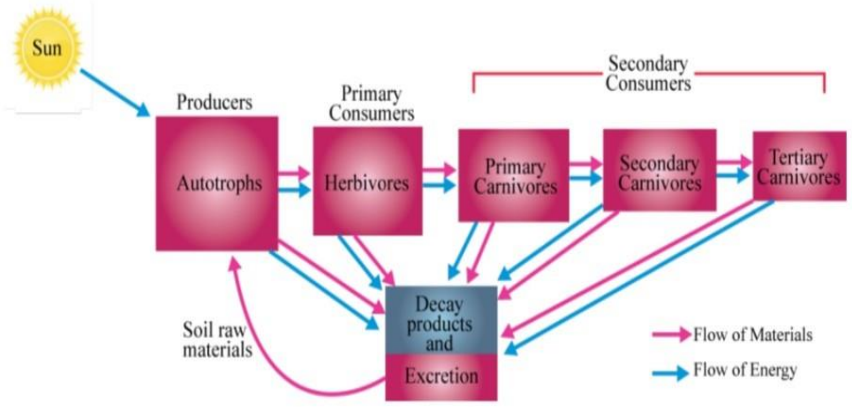
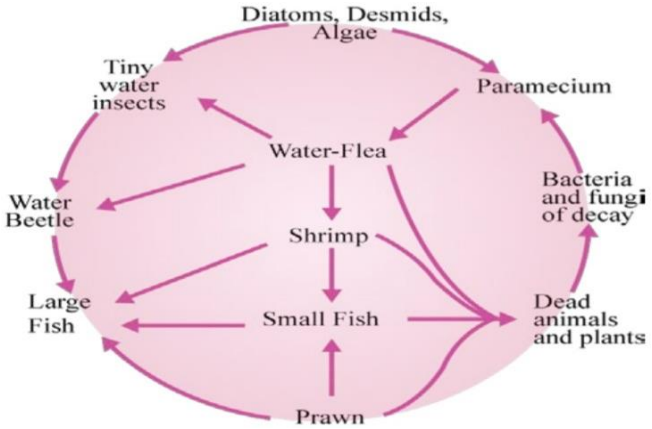


Fig: An over-view of relationship between different organism in ecosystem

FOOD WEB: The different food chains are inter connected at various trophic level to develop a food web. For example, in grassland ecosystem, grass is consumed by the rabbit but in their absence, it may be eaten by the grazing cattle. Similarly, rat or mouse is eaten by snake but snake can be eaten by predatory birds. In contrast to food chain, food web has several distinct characteristic. (1) Food web are never straight. (2) Food web is formed due to interlinking of food chains. (3) A food web in the ecosystem brings alternate source of food. The complex food web gives better stability to the ecosystem. Most of the animals are polyphagous and they feed on more than one kind of organism. If the availability of one particular animal is decresing in the ecosystem, they start eating alternate animal. As a result, it gives chance to other animal to reproduce and grow in number and in addition, it gives chance to predator to survive.

Fig: Food web in a pond



NICHE: The niche is the set of biotic and abiotic condition in which a species is able to persists and maintain stable population sizes. The ecological niche is a central concept in the ecology of organism and sub-divided into the fundamental and the realized niche. The fundamental niche is the set of environmental condition under which a species is able to persist. The realized niche is the set of environmental plus ecological condition under which a species persist. The Hutchinsonian niche is defined more technically as an "Euclidean hyperspace whose dimensions as environmental variable and whose size is a function of the number of values that the environmental values may assume for which an organism has positive fitness".

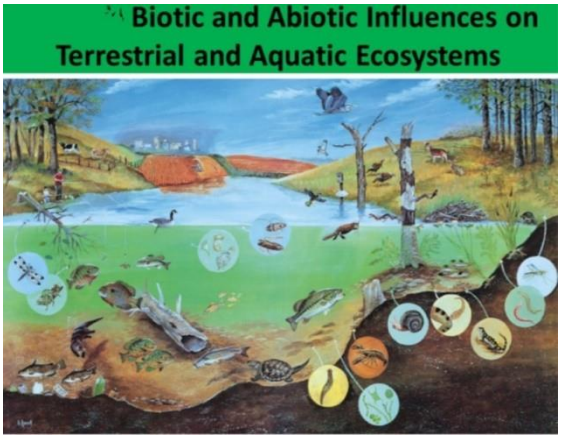
HABITAT: The habitat of a species is a related but distinct concept that describes the environment over which a species is known to occur and the type of community that is formed as a result. More specifically," habitat can be defined as regions in environmental space that are composed of multiple dimensions, each representing a biotic or abiotic environment related directly (e.g. forage biomass and quality) or indirectly (e.g. elevation) to the use of a location by the animal.

ECOSYSTEM: An ecosystem is a community of living organism in conjunction with the non-living component of their environment, interacting as a system. These biotic and abiotic components are linked together through nutrient cycle and energy flows. Ecosystem are controlled by external and

internal factors. External factors such as climate, the parent material which forms the soil and topography, control the overall structure an ecosystem, but are not themselves influenced by the ecosystem.

The term Ecosystem first coined by British Ecologist Sir Arthur G. Tnasley in 1935.

- **Major types of Ecosystem:**
  1. Marine Ecosystem (based on structure and function of marine system).
  2. Terrestrial Ecosystem (based on natural or native condition of vegetation).
  3. Aquatic Ecosystem (depends on the goods and services provided bi natural ecosystem).
     The aquatic ecosystem two types: Lentic (the ecosystem of lake, pond or swamp) and Lotic (the ecosystem of river, stream or spring).



- **Structure and function:**

  By structure we mean:
  1. The composition of biological community including species number biomass, life history and distribution etc.
  2. The quality and distribution of the non-living materials, water etc.
  3. The range of gradient of condition of existence. Such as temperature, light etc.

- **By function we mean:**
  1. The rate of biological energy flow.
  2. Rate of materials or nutrient cycles.
  3. The biological or ecological regulation including both regulation of organism by environment and regulation of environment by the organism.

     The components factors of any ecosystem can be discussed into two broad headings
     a. Abiotic factors:
        I. Flow,
        II. Light,
        III. Temperature,
        IV. Chemistry,
        V. Substrate.
     b. Biotic factors:

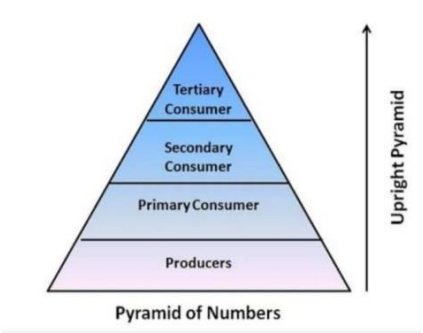
I. Bacteria,
II. Primary producer,
III. Insect and other invertebrates,
IV. Fish and other vertebrates.

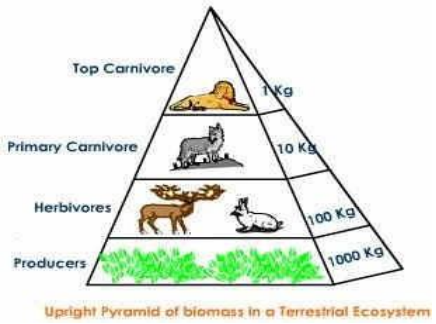
ECOLOGICAL PYRAMIDS: In a food chain, producers and consumers at different trophic level are connected in terms of number, biomass and energy. These properties reduces from producers to consumers and representing these parameters for food chain gives a pyramid with a broad base and a tapering apex. Ecological pyramids can be of three types:

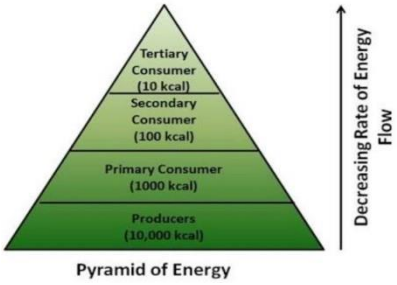
(a) Pyramid of Numbers

(b) pyramid of biomass

(c) pyramid of energy







Preamble:-

The word “Environment” is derived from a French word “Environ” meaning encircle .Nature has gifted us a wide variety of flora and fauna and it is our foremost duty ,not only to discover had learn them but utilize and conserve them properly .Our thirst knowledge is not completed until and unless we observe and study them face to face rather only to read them in the pages of our books. The study of science needs a profound observation power had analytical conclusion regarding our topic.

It is usually admitted that field study is one of the most essential and valuable part of the study for the students related to the natural history i.e. Zoology.

The living world around us is infinitely and gloriously complex .Field study had Excursion is the study of Biological Diversity in the natural habitat which cannot be made in the closed ambience of classroom lobotomy.

Study of individuals in their locality can be made in their natural environment and not in isolation. This includes the following-

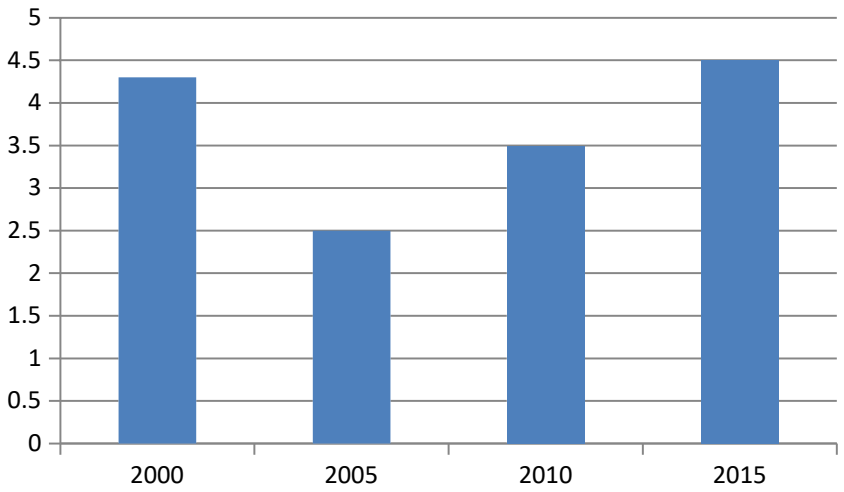
- Habit
- Habitat
- Interaction with environment
- Interaction within species
- Interaction between species

Estimation Of Biodiversity By The Use Of Bio-statistics:

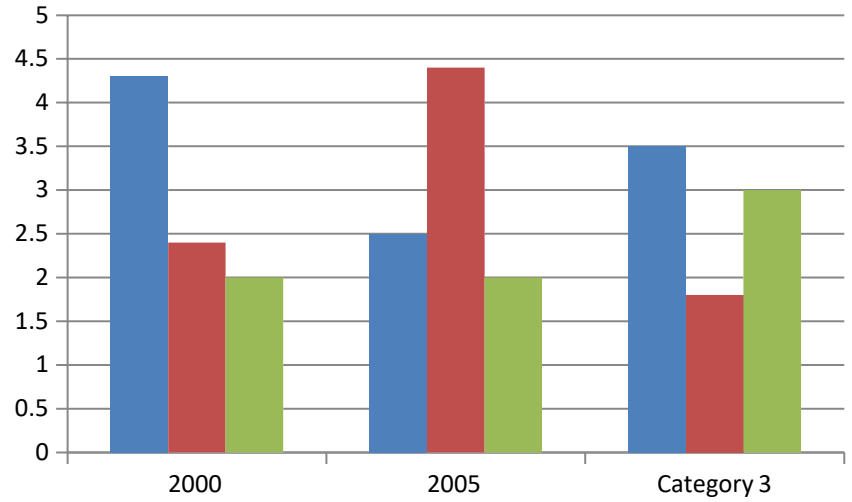
Diagrammatic representation of statistics are two types-Bar diagram and Pie diagram.

- Bar diagram is of four types:-

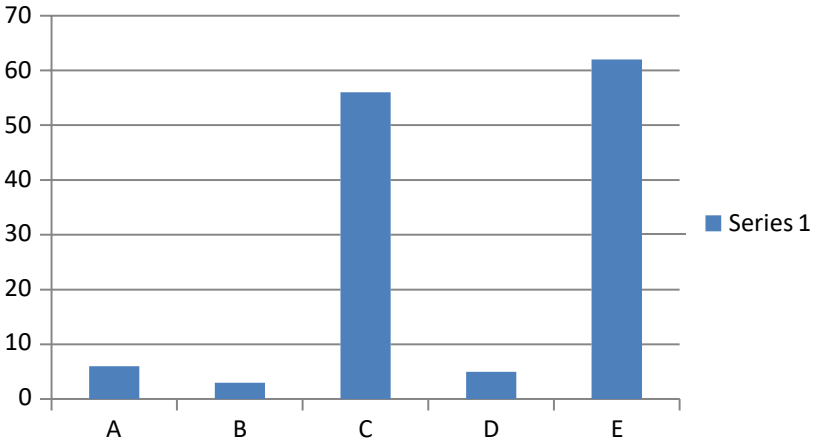
(1) Simple Bar Diagram



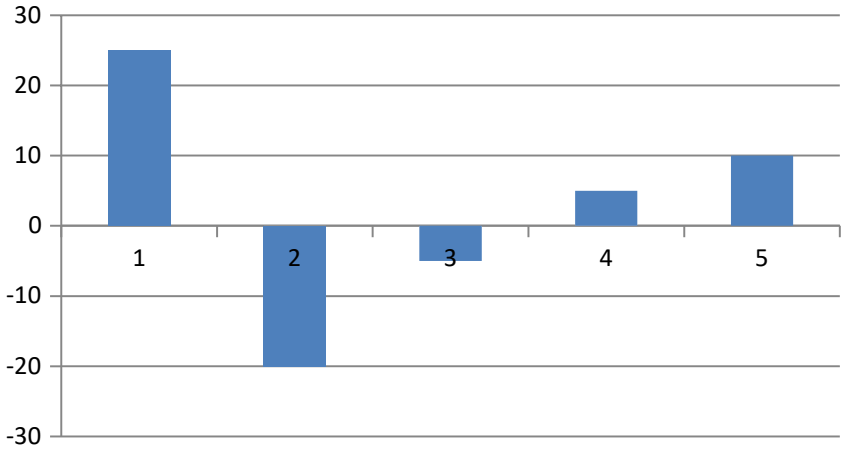
(2) Multiple Bar Diagram



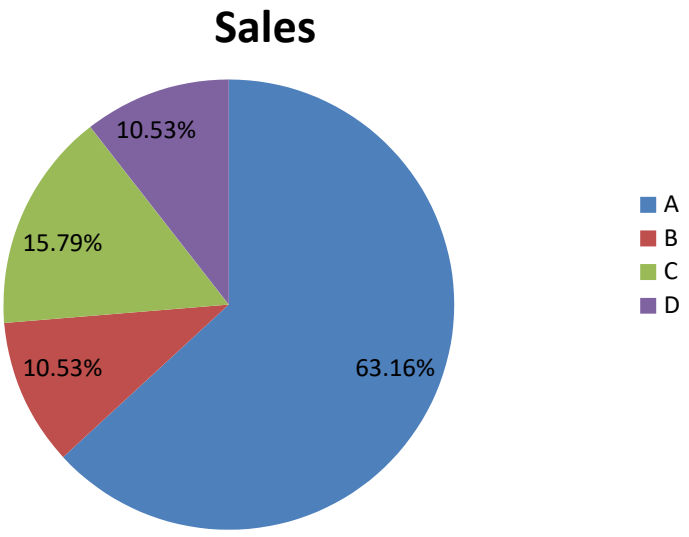
(3) Broken Bar Diagram



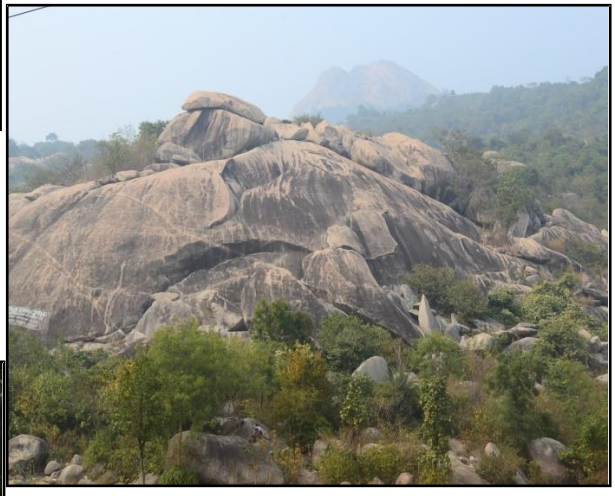
(4) Deviation Bar Diagram



- Pie diagram



FIELD STUDY AT PANCHALINGESWAR



ABOUT PANCHALINGESWAR

Panchalingeswar is a famous tourist spot situated near by Balasore district of Odisha. Panchalingeswar is located on a hillock near nilgiri which is popular for its natural surroundings. The main attraction of the place is a temple having five linges with a perennial spring flowing over them. The place derived its name from the five lingams that are also known as Panchalingeswar.

Geography:

- Panchalingeswar is 27.7 km south west from Balasore.
- Geographical co-ordinate is 21.41 North 86.71 East.
- Average annual temperature is 26.7c.
- Average rainfall is 1601mm.

PANCHALINGESWAR TEMPLE:

The temple is located on the top of the hills .The hill ranges make an attraction to the visitors. To reach the top of the auspicious heavenly abode of Lord Shiva,one must climb the 260 stairs up the hill. On both sides of the stairs,rocks of different sizes can be seen. Water from the falls on the hilltop is trickling down under the rocks. People used to enjoy bathing in the flowing water between these rocks. This is a unique place where one can find five Shiva lingas. Nilgiri kings found those lingas long ago. Panchalingeswar is actually part of the Kuldiha forest. Kuldiha is called an Elephant Sanctuary.Many animals,including elephants, bison, bears, deers, and panthers are found in this forest.

On top of the Panchalingeswar temple, there is an another temple of Banadevi. There is a small lake In front of that temple.According to the local people, this pond is not connected to any external water flows but is self-oozing.Sitting near the pond, you can clearly see the bubbles coming from the bottom of the lake.On the top of the hill, there are many small waterfalls which are mesmerizing for the visitors.

Floral Biodiversity in Panchalingeswar:

Panchalingeswar supports a wide range of Floral biodiversity. many rare and potential high value medicinal herbs used to flourish in their natural habitat spontaneously inside the Panchalingeswar Hill areas and localities.Atop the hill and valleys, many rare medicinal plants can be seen, such as Strychnus nuxvomica(Visha tinduka), Bombox malbaricum (Shimili cotton/tula), Bombox ceiba(Shimuli), Cassia angustifolia, Cassia fistula, Cassia alata, Boswellia serrate(Shallaki), Adhatoda vasica(Bsanga), Cissalpinia crista(Lata karanja),Premna integrafolia(Agnimantha).

(Basanga) and various other species of plants can be seen, such as Abrus precatorius (Gunja), Shorea robusta(Shal tree), Dalbergia sissoo(Shisu), Asparagus racemosus(Shatavari) etc.

Faunal Biodiversity in Panchalingeswar:

This place harbors a wide range of biodiversity. Elephants are also often can be seen roaming in this valley. Species of rare snakes, including the king cobra, large pythons, boa constrictors,and common kraits, etc., can be seen in these jungles. Other animals,like hares, rabbits, hedgehogs, boars, bears, cheetah, wolves, monkeys are very common in this region. Also seen in the forest are a variety of birds, such as peacocks, peahens, wild pigeons, cuckoos, parrots, and wild fowls. During the autumn and spring seasons, the valley becomes alive with a canvas of various colours as different species of flowers blossom.

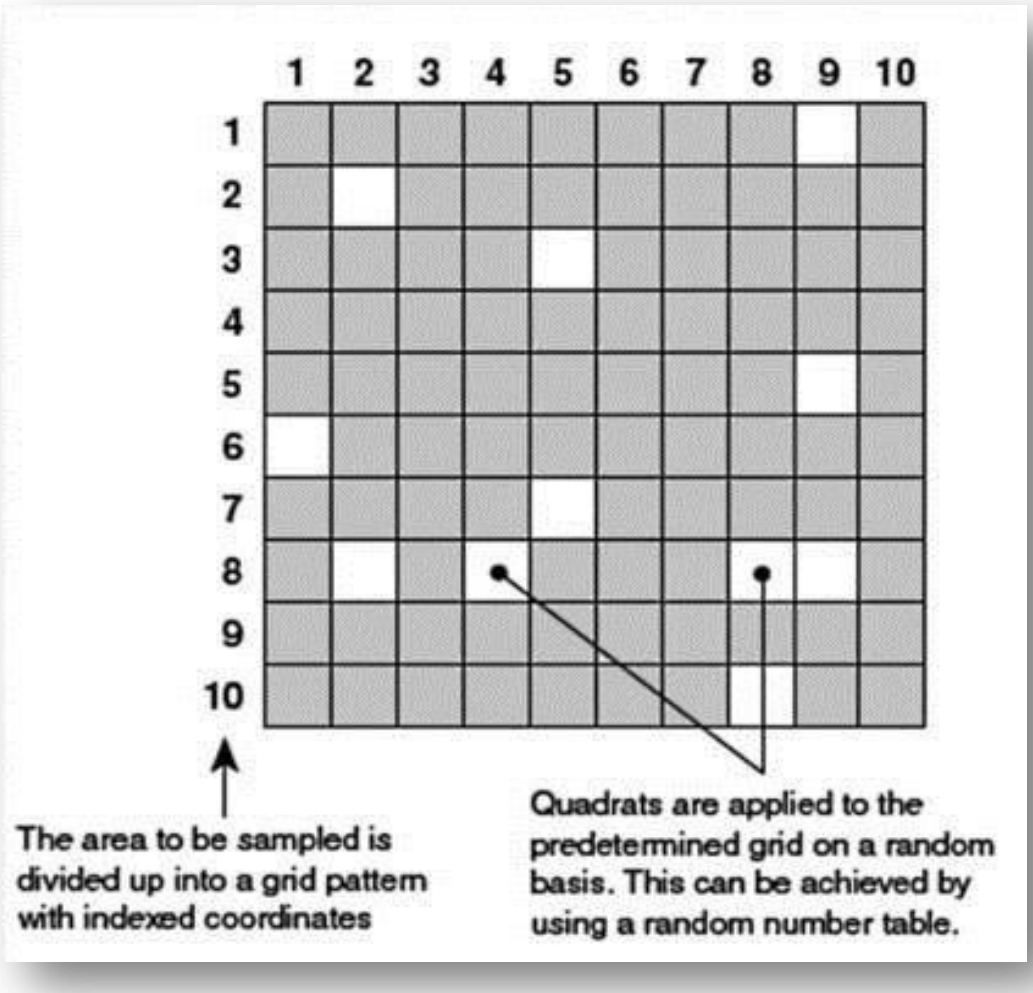
A NOTE ON QUADRAT STUDY:

Introduction: The most important aspect of any study on biodiversity (either plant or animal diversity) is to select some representative plots & then record the number of all plants or animals lyingwithin the plot & at last calculating the average diversity index from the recorded observations. "Quadrate Study" is one of the most familiar and useful tool in this regard.

What is a Quadrat? - Quadrate is well defined geometric structure which is further subdivided into sub-quadrate and is useful for measuring the relative number of plants & animals in specific habitat.

The most useful shape of a quadrate is square, but it can be a triangular or circle.

According to my animal of interest the size of the Quadrat also varies, as we are studying dragonflies here, we have used 100 sq. ft. as a unit of Quadrat.



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QUADRATE STUDY OF PLANT SPECIES IN PANCHALINGESWAR

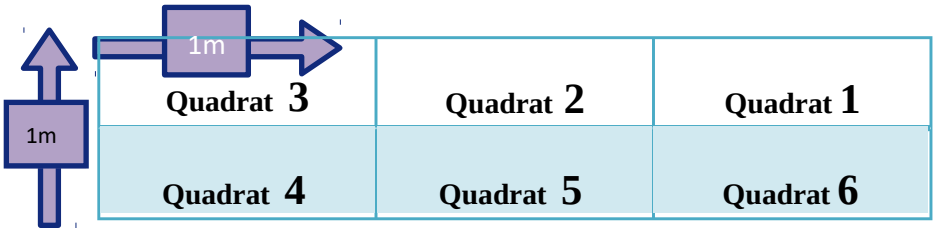
Place : Panchalingeswar

Date : 12.01.18

Time :4:00 pm

Requirements :

- **Wooden quadrate frame(1m2)**
- **Rope**
- **Measuring tape**
- **Field note book**
- **Pocket lens, pen, pencil**



Methods:

1. Quadrate was formed by the help of rope measuring and 1m long wooden stick in a selected area.
2. The quadrate having 6m2 area which were divide 6 equal sub-quadrate which had the length of area 1m2.
3. Then the species variety of the floral diversity were required.

Name of the specimen	Quadrate 1	Quadrate 2	Quadrate 3	Quadrate 4	Quadrate 5	Quadrate 6	Total no. of individuals	Total no. of specimen
Specimen A	4	5	3	5	6	0	23	162
Specimen B	1	4	0	2	1	0	8	
Specimen C	9	0	3	2	4	4	22	
Specimen D	19	10	5	6	12	16	68	
Specimen E	11	5	5	5	9	2	37	
Specimen F	0	0	4	0	0	0	4	

Simpson's index, $D_S = \sum_{i=0}^{n} \frac{(ni-1)}{N(N-1)}$

Where, n= Total no. of individuals of the species

N= Total no. of individuals of the all species(Total species)

$$D_S = \sum_{i=0}^{n} \frac{(i-1)}{N(N-1)}$$

$$= \frac{23(23-1)}{162(162-1)} + \frac{8(8-1)}{162(162-1)} + \frac{22(22-1)}{162(162-1)} + \frac{68(68-1)}{162(162-1)} + \frac{37(37-1)}{162(162-1)} + \frac{4(4-1)}{162(162-1)}$$

$$= 0.01940 + 0.00214 + 0.0177 + 0.1746 + 0.0510 + 0.00046$$

$$= 0.2653$$

$$\frac{1}{Ds} = \frac{1}{o.2653} = 3.769$$

Frequency, Density and Abundance of species:

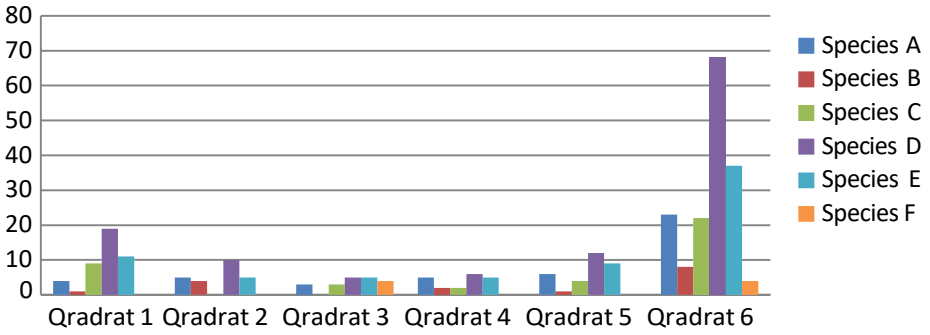
$$\text{Frequency}(\%) = \frac{\text{Total no. of Quadrates} \in \text{which species has occurred}}{\text{Total no. of Quadrate study}} \times 100$$

$$\text{Density} = \frac{\text{Total no. of individuals of the species}}{\text{total no. of Quadrate studied}}$$

$$\text{Abundance} = \frac{\text{Total no. of individuals of the species}}{\text{Total no. of Quadrates} \in \text{which species has occurred}}$$

SL.No.	Name of species	Total no. of species	Total no. of quadrates in which species occured	Total no. of quadrate studied	Density	Abundance	Frequency
1	Species A	23	5	6	$\frac{23}{6}=3.8$	$\frac{23}{5}=4.6$	$\frac{5}{6}\times 100=8$
2	Species B	8	4	6	$\frac{8}{6}=1.33$	$\frac{8}{4}=2$	$\frac{4}{6}\times 100=6$
3	Species C	22	5	6	$\frac{22}{6}=3.6$	$\frac{22}{5}=4.4$	$\frac{5}{6}\times 100=8$
4	Species D	68	6	6	$\frac{68}{6}=1.3$	$\frac{68}{6}=1.33$	$\frac{6}{6}\times 100=1$
5	Species E	37	6	6	$\frac{37}{6}=6.1$	$\frac{37}{6}=6.16$	$\frac{6}{6}\times 100=1$
6	Species F	4	1	6	$\frac{4}{6}=0.66$	$\frac{4}{1}=4$	$\frac{1}{6}\times 100=1$

QUADRAT STUDY AT PANCHALINGESWAR



PROCEDURE FOR ANALYSIS OF WATER

A. DETERMINATION OF FREE CO_2 IN WATER

PRINCIPLE:-

Free carbon dioxide (CO_2) in water sample can be measured by titrating the test sample against a strong alkaline (pH=8.3) where all free CO_2 molecules in the test sample is converted into bicarbonate.

REACTIONS:-

$2NaOH+CO_2=Na_2CO_3+H_20$

$Na_2CO_3+H_2O+CO_2=2NaHCO_3$

MATERIALS NEEDED:-

- Apparatus:
    1) Burette and burette stand
    2) Conical flask
    3) Stoppered bottle for sample water collection
    4) Reagent

- Reagents:
    1) 1/44 (N) NaOH solrtion
    2) Phenolphthaline indicator

PROCEDURES:-

- Water samples are collected in different ways for analysis. For the estimation of dissolver gases, mixing with air or bubbling is avoided. Water may be collected in a large beaker or in a plastic bucket and transformed to a sampling bottle by a siphon tube. CO_2 measurement should be done immediately because it is liable to escape easily from the sample.
- 50ml of a water sample was taken in a conical flask.
- A few drop of the phenolphthaline indicator were added to the sample.
- The flask was placed against a white back ground and if the colour of water turned pink at first, there is no free co_2 in it.
- If the sample remained colourless, then it was tritated against N/44 NaOH. At the end point a faint pink colour appeared and the burette reading was noted.

PRECAUTIONS:-

1) Strictly avoid bubbling during collection of test water.
2) Prevent agitation of the collected sample in the transmit.
3) The surface of the test sample must be covered as far as possible during titration.

OBSERVATION:-

❖ **TABLE :1**

Place: Panchalingeswar
Time: 1:20pm
Date: 12.01.18

No.of observation	Sample taken(ml)	Burette observation(ml)		Difference(ml)	Mean(ml)
		Initial	**Final**		
1	50	-----	-----	------	------
2	50	-----	-----	------	
3	50	-----	-----	------	

CALCULATION:-

$$\text{Total free } co_2 = \frac{ml\ of\ NaOH \times Normality\ of\ NaOH \times 1000 \times 44}{ml\ of\ sample\ taken\ for\ titration}$$

Where, Normality of NaOH= 1/44, 44= Equivalent weight of NaOH

$$\text{Total free } co_2 = \frac{ml\ of\ NaOH \times Normality\ of\ NaOH \times 1000 \times 44}{ml\ of\ sample\ taken\ for\ titration}$$

=Not found

INFERENCE:-

Free CO_2 content of water sample is not found.

❖ **TABLE-2:**

Place: Panchalingeswar
Time: 5.30AM
Date: 13.01.18

No.of observation	Sample taken(ml)	Burette observation(ml)		Difference(ml)	Mean(ml)
		Initial	**Final**		
1	50	0	1.1	1.1	1.2
2	50	1.1	2.3	1.2	
3	50	2.3	3.6	1.3	

CALCULATION:-

$$\text{Total free } co_2 = \frac{ml\ of\ NaOH \times Normality\ of\ NaOH \times 1000 \times 44}{ml\ of\ sample\ taken\ for\ titration}$$

Where, Normality of NaOH= 1/44, 44= Equivalent weight of NaOH

$$\text{Total free } co_2 = \frac{ml\ of\ NaOH \times Normality\ of\ NaOH \times 1000 \times 44}{ml\ of\ sample\ taken\ for\ titration}$$

$$= \frac{1.2 \times 1/44 \times 1000 \times 44}{50}$$

=24.0 mg/lit

INFERENCE:-

Free CO_2 content of water sample is 24.0mg/lit, which indicate that CO_2 content is very high and as CO_2 is an lumitady factor of aquatic life. So, this high content of CO_2 does not support aquatic life.

B. DETERMINATION OF DISSOLVED O_2 IN WATER

PRINCIPLE:-

By chemical experiment it is known that manganoussulphate reacts with sodium or potassium hydroxide to produce white precipitate of $Mn(OH)_2$ [Manganese hydroxide]. This $Mn(OH)_2$ reacts with oxygen in alkaline medium and oxidized to form brown coloured manganese oxihydrate. This oxidation reaction depends on the amount of oxygen present in water. In concentrated acid medium (H_2SO_4) iodide ions (I^-) reduces manganese and itself is converted into molecular I_2. The amount of free iodine = Amount of O_2 in the sample. The amount of the iodine is determined by titration of thiosulphate solution where starch is used as indicator.

CHEMICAL REACTIONS:-

$MnSO_4 + 2NaOH = Na_2SO_4 + Mn(OH)_2$ [White ppt.]

$2Mn(OH)_2 + O_2 = 2MnO(OH)_2$ [Brown ppt.]

$MnO(OH)_2 + 4NaHSO_4 + 2KI = I_2 + MnSO_4 + K_2SO_4 + 2Na_2SO_4 + 3H_2O$

$I_2 + 2Na_2S2O_4 = 2NaI + Na_2S_4O_6$

MATERIALS REQUIRED:-

- Apparatus:

1) Measuring cylinder
2) 10ml pipette
3) Conical flask(250ml)
4) Stoppered reagent bottle(250ml)
5) Burette with stand

- Reagents:

1) Alkaline iodide
2) Manganous sulphate
3) 0.025(N) Sodium thiosulphate
4) Concentrated H_2SO_4
5) 1% Starch solution(Indicator)

PROCEDURE:-

- 250 ml of water was collected in a bottle whose stopper can be operated under water.
- ml of alkaline iodide and 1 ml of MnSO4 is added to the sample water.

- The bottle was closed tightly and the solution was mixed thoroughly, kept for a while. The yellowish brown ppt. appeared at the bottom of the bottle and the supernatant was transparent.
- Then 1 ml of concentrated H2SO4 was added to it by a pipette. Again the solution was mixed thoroughly.
- Precipitate was dissolved and the solution turned light brown due to the presence of molecular iodide.
- 50 ml of the treated sample solution was taken in a conical flask and 2-3 drops of starch solution was added to the sample, the solution turns blue.
- 0.025 (N) $Na_2S_2O_3$ solutions was taken in the burette for titration. The reading was taken before titration starts and then titration was done till the blue colour disappears. Again the final burette reading was taken.
- This process was repeated thrice to observe better result.

PRECAUTIONS:

- Care should be taken to avoid exposure of the sample to air while collecting the sample.
- The sample should not be agitated before fixation.
- The surface of the sample exposed to air during titration should be kept as well as possible.
- The starch indicator solution must be freshly prepares before the experiment.
- The fixation and reagent should be carefully added by a pipette.

OBSERVATION:-

❖ **TABLE:1**

Place: Panchalingeswar
Time: 1:00pm
Date: 12.01.18

No.of observation	Sample taken(ml)	Burette observation(ml)		Difference(ml)	Mean(ml)
		Initial	**Final**		
1	50	0	1.5	1.5	1.6
2	50	1.5	1.6	1.6	
3	50	3.1	1.7	1.7	

CALCULATIONS:-

$$\text{Dissolved Oxygen(mg/lit)} = \frac{V1 \times N1 \times E \times 1000}{V4 \times \frac{(V2 - V3)}{V4}}$$

Where,

V_1= Volume of titrate

V_2= Volume of water

V_3= Volumew of alkaline iodide and $MnSO_4$

V_4= Volume of water sample used for titrate

N= Normality of Na_2S_2O

= 0.025

E= Equivalent weight of Oxygen

= 8

$$\text{Dissolved Oxygen(mg/lit)} = \frac{V1 \times N1 \times E \times 1000}{V4 \times \frac{(V2 - V3)}{V4}}$$

$$= \frac{1.6 \times 0.025 \times 8 \times 1000}{50 \times \frac{(250-2)}{250}}$$

= 6.45 mg/lit

INFERENCE:-

The amount of dissolved O_2 in sample water is 6.45 mg/lit. The amount is little bit higher than optimum dissolved O_2 value of freshwater i.e. 5 mg/lit, indicating that water has little organic pollution. Thus water can not ideal for aquatic life, with medium capacity of in taking waste water and medium productivity value.

❖ **TABLE:2**

Place: Panchalingeswar

Time: 5:30am

Date: 13.1.18

No.of observation	Sample taken(ml)	Burette observation(ml)		Difference(ml)	Mean(ml)
		Initial	**Final**		
1	50	0.4	1.6	1.2	1.2
2	50	1.6	2.6	1.0	
3	50	2.6	4.0	1.4	

CALCULATIONS:-

$$\text{Dissolved Oxygen(mg/lit)} = \frac{V1 \times N1 \times E \times 1000}{V4 \times \frac{(V2 - V3)}{V4}}$$

Where,

V_1= Volume of titrate

V_2= Volume of water

V_3= Volumew of alkaline iodide and $MnSO_4$

V_4= Volume of water sample used for titrate

N= Normality of Na_2S_2O

= 0.025

E= Equivalent weight of Oxygen

= 8

$$\text{Dissolved Oxygen(mg/lit)} = \frac{V1 \times N1 \times E \times 1000}{V4 \times \frac{(V2 - V3)}{V4}}$$

$$= \frac{1.2 \times 0.025 \times 8 \times 1000}{50 \times \frac{(250 - 2)}{250}}$$

= 4.83 mg/lit

INFERENCE:

The amount of dissolved O_2 in sample water is 4.83 mg/lit. The amount is less than optimum dissolved O_2 value of freshwater i.e. 5 mg/lit, indicating that water has high degree organic pollution. Thus water can not support for aquatic life and with high contamination, water has very poor or low productivity value.

C. Determination of pH in water :

Theory:

Potential of Hydrogen ion or simply; pH is a value on a scale ranging from 0 to 14, which gives a measure of the acidity or alkalinity of a given sample.

In formulative term, pH is the negative logarithm of Hydrogen ion concentration, i.e. pH= log[H^+]; where,[H^+] = molarity of H^+ in the medium under study.

-

Collecting water sample measured by ‘Pocket pH tester’.

Observation:

Place: Panchalingeswar

Time: 1 pm

Date: 12.01.18

No. of observation	pH value	Mean
1.	6.5	6.5
2.	6.6	
3	6.4	

Inference:

pH of water sample from Panchalingeswar is 6.5(slightly acidic).

Bird watching:-

Birth watching or birding is a form of wildlife observation in which the observation of birds is a recreational activity .It can be done with the naked eye, through a visual enhancement device like binoculars and telescopes, or by listening for bird sounds.
Bird watching often involves a significant auditory component, as many bird species are more easily detected and identify by ear than by eye .Most birdwatchers pursue this activity for recreational or social reasons, unlike ornithologists, who engage in the study of birds using formal scientific methods.

Birder:- The acceptable term used to describe the person who seriously pursues the hobby ofbirding .May be professional or amateur.

Birding:-A hobby in which individuals enjoy the challenge of bird study, listing , or other general activities involving bird life.

Bird-watcher:-
A rather ambiguous term used to describe the persons who watches birds for any reason at all, and should not be used to refer to the serious birder.

Need of ornithology:-

- Study of living birds in its nature habitat.
- Collection of precise information about birds ecology, habits, behaviour, adaption of environment, acquiring mate, nest making, social organization and population dynamics.

Components and equipments:-

- ❖ A binocular.
- ❖ A note book
- ❖ A reference book-a pocket guide to the birds.

TIPS FOR BIRDWATCHING:-

- **Study a good field guide**
  Familiarise yourself with different families of birds. Study a good field guide until you can tell a goose from a grebe or a wagtail from a warbler, for instance.

- **Take notes and sketches**
  Take notes and sketches while out bird watching. Try not to look at your field guide before you have studied the bird you wish to identify.

- **Get some good binoculars**
  Get a decent pair of binoculars. you will be entering a new world of wonder.

- **Use your binoculars the right way**
  Always take your binocular with you. You never know what you may see.

- **Don’t look down**

When you sea bird, don't look down at the binoculars. Keep your eye on the bird and raise the binoculars to your eyes, then quickly adjust the focusing wheel to get a sharp image. This will help you to avoid missing birds.

- **Use telescope for long range**
  When watching birds in open country, such as wildfowl on a lake, wader at an estuary or seabirds offshore, a telescope will hugely enhance your ability to identify birds at long range.

- **Practice good fieldcraft**
  Be slow and patient and avoid sudden movement. Don't wear bright clothing or materials that make a loud rustling sound, and try to avoid talking or even whispering loudly when near wary birds.

- **Use hides where possible**
  Most bird reserves have at least one hide. You will get brilliant views of birds that are otherwise hard to see well, and this is an excellent way to became really familiar with their distinctive features.

- **Learn bird calls and songs**
  Don't forget that as well as watching them, you can identify many birds by listening to their calls and songs.

STEPS OF BIRD WATCHING

1. First step:- The ability of recognize with confidence the common birds of any locality.
2. Second step:- To ensure oneself of just what one had seen.
3. Third step:- To put down birds size, general colour, any social marking and their positions, shapes, colour of the bills, legs, wings, tails, necks, and if possible eyes.
4. Fourth step:- Social way of fliying and calling notes are useful identifying marks(if possible).

BIRD WATCHING AT PANCHALINGESWA

Place: Panchalingeswar
Date: 13.1.18
Time: 7:00 am

1. **Black Drongo**

- Scientific name: Dicrurus macrocercus

- Description:

  - Glossy black plumage.
  - Long deeply forked tail.
  - Diagnostic white spot at the base of bill.

2. **Common myna**

- Scientific name: Acridotheres tristris

- Description:

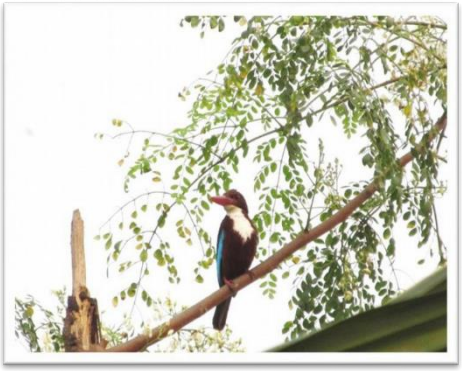
  - Medium sized birds with vinous brown plumage, black head, neck and upper breast, yellow beak legs.
  - Naked wattle around eyes distinctive,
  - large white spot in dark brown flight feathers, best visible in flight,blackish tail.

3. **White throated kingfisher**

- Scientific name: Halcyon smyrnensis

- Description:

  - Chestnut-brown head, neck and under body below breast; bright turquoise-blue above, often with greenish tinge.
  - White chain, throat and breast distinctive.
  - Coral red break and legs.



4. Green bee-eater

- Scientific name: Merops orientalis

- Description:
  - ➢ The entire plumage is bright green and tinged with blue especially on the chin and throat.
  - ➢ A fine black line runs in front of and behind the eye.
  - ➢ The iris is crimson and the bill is black while the legs are dark grey.
  - ➢ The wings are green and the break is black.

5. Cattle Egret

- Scientific name: Bubulcus ibis

- Description:
  - ➢ Small snowy-white heron with characteristic hunch and relatively short legs and thick neck.
  - ➢ Bright yellow bill, yellow eyes.
  - ➢ Breeding adult white with orange-buff feathers on crown, neck and back
- Size: 50cm

6. Asian palm swift

- Scientific name: Cypsiurus balasiensis

- Description:
  - ➢ It is mainly pale brown in colour.
  - ➢ It has long swept-back wings that resemble a crescent or a boomerang.
  - ➢ The body is slender, and the tail is long and deeply forked, although it is usually held closed.
  - ➢ It has very short legs.

7. Rufous Treepie

- Scientific name: Dendrocitta vagabunda

- Description:

  - Rufous above sooty-grey brown head and neck; black, white and grey on wings best seen in flight.
  - Black-tipped, grey tail long and graduated.

8. Blue Whistling thrush

- Scientific name: Myophonus caeruleus

- Description:

  - A glossy violet-blue plumage
  - The nominate race has black bill, legs and feet and reddish to dark brown eyes.
  - The underparts are dull blue on lower breast and belly.

9. Spotted Dove

- Scientific name: Stigmatopelia chinensis

- Description**:**

  - Slender dove with long wedged tail
  - White spotted black hind neck-collar(chessboard) diagnostic.
  - Grey and pink brown above.
  - Dark tail with broad white tips to outer feathers seen in flight; vinous-brown breast.

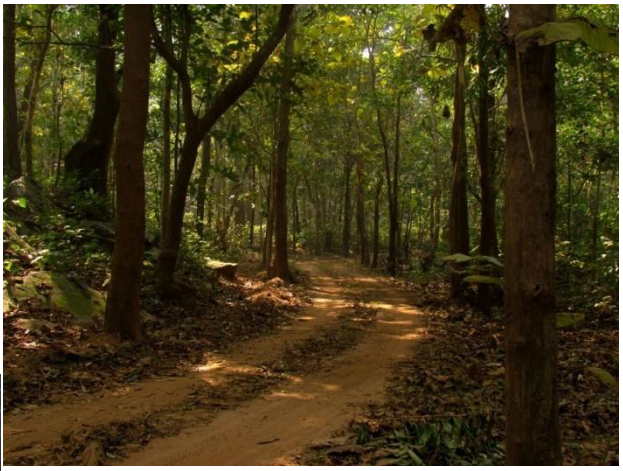
10. Common tailor bird

-Scientific name: Orthotomus sutorius

•Description:

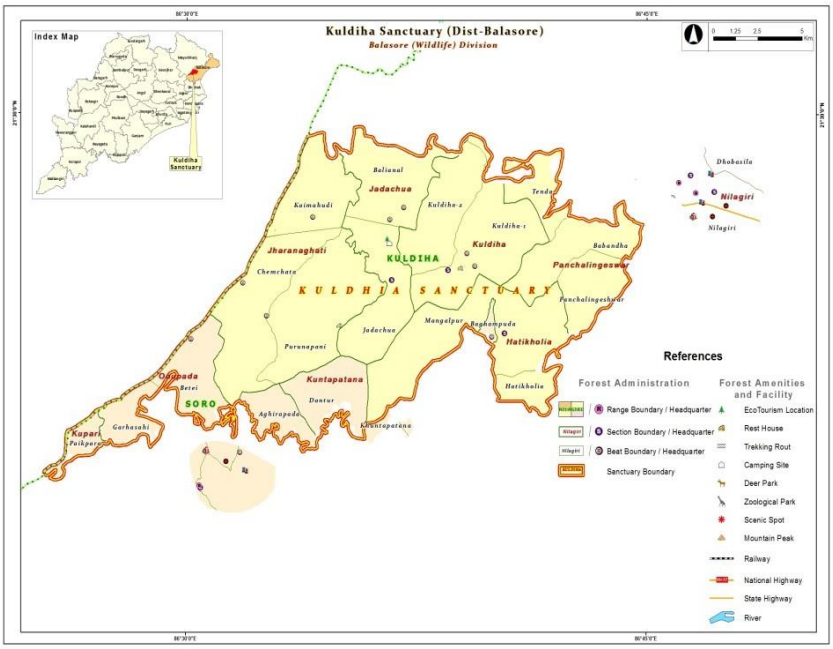
- ➢ Olive-green above; rust-red fore-crown; buffy-white underbody; dark spot on throat sides.
- ➢ Long, pointed tail, often held erect.
- ➢ Eyes are pale brown; legs and feet are pinkish; wings are short and rounded.

FIELD STUDY AT KULDIHA FOREST



ABOUT KULDIHA FOREST

The **Kuldiha Wildlife Sanctuary** is situated in the Balasore district of Odisha, India. The sanctuary is spread across 272.75 km^2 (105 sq mi) in the Chota Nagpur Plateau region. It is linked with Simlipal National Park via the Sukhupada and Nato hill ranges. It is classified as an Eastern Highlands moist deciduous forests ecoregion.



It was declared a sanctuary on 4 January 1984. It is famous for the Mayurbhanj Elephant Reserve that spreads across Simlipal, Kuldiha and Hadgarh wildlife reserves. Locally in Kuldiha, the elephant reserve is known as Tenda Elephant Reserve. There is a watch tower strategically created at Garsimulia for animal lovers to have a look at elephants bathing or drinking water from a small stream that runs right through the reserve. The sanctuary offers night stay accommodation at Kuldiha entrance, Jadachua and Rishia in form of huts, tents and a few concrete houses. Prior reservation is required for night stay. It is usually closed during the peak monsoon season which typically falls between July and September. Major fire was reported in 2012 that engulfed both Simlipal and Kuldiha forests causing significant damage to flora and fauna. The sanctuary has been declared an ecological sensitive zone as of August 2, 2013 by the government.

Tourism

Kuldiha is an integral part of tourism in northern Odisha, attracting tourists and scholars alike.

Ecotourism

Odisha's government took recognition of the environmental damage being done by private operators to many parks, sanctuaries and reserves resulting in a sustainable threat to biodiversity. It came up with an ecotourism focus to conserve the pristine state of nature while making it economically viable with a PPP model. Kuldiha sanctuary is operated in a community based ecotourism model that benefits locals and tribesmen inhabiting the core area of the sanctuary

Flora and fauna

It is a mixed deciduous forest dominated by the Sal tree. Various animals inhabit the forest, including Tiger, Leopard, Elephant, Gaur, Sambar, Giant Squirrel, Hill Myna, Peafowl, Hornbills, other migratory birds and reptiles . A comprehensive scientific report on the animal species present in the park is available in this survey. The sanctuary is a haven for environmental and animal research. There are numerous scientific surveys and reports available that focus on the study of flora and fauna of the sanctuary.

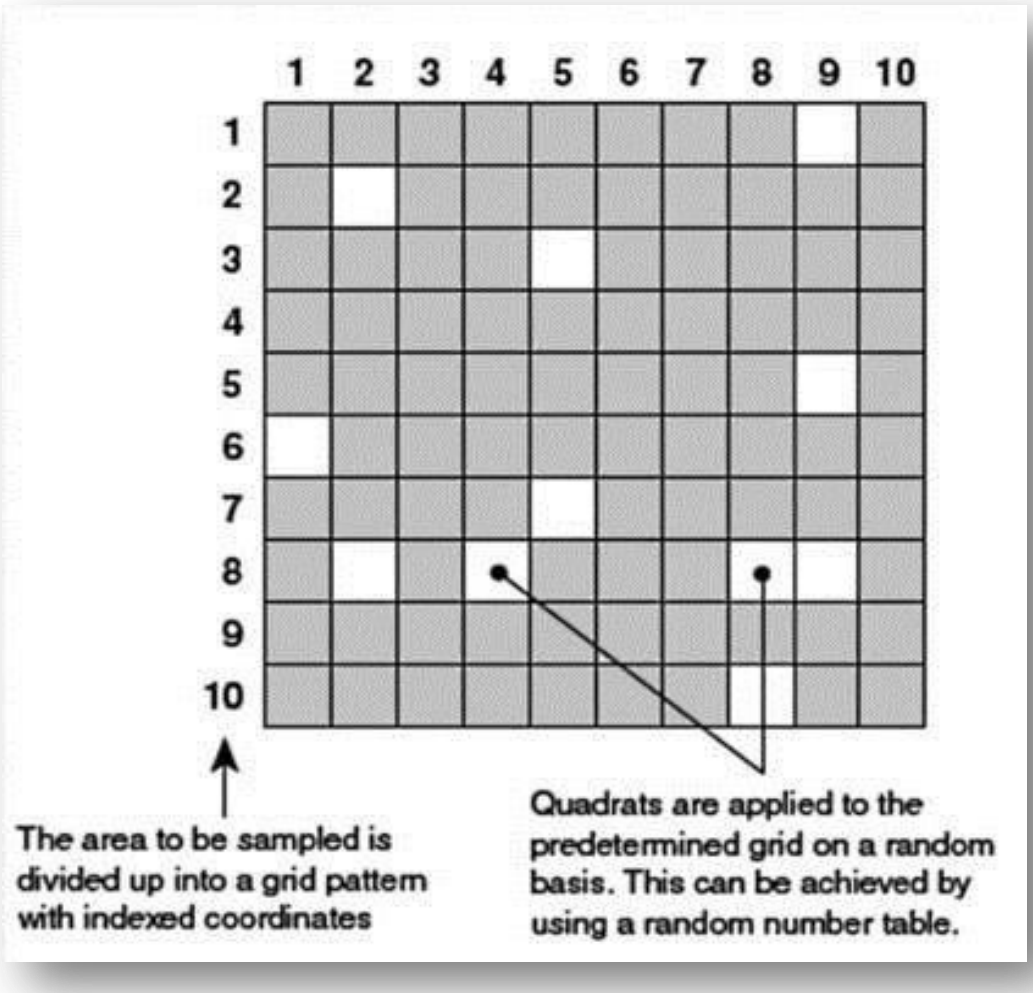
A NOTE ON QUADRAT STUDY:

Introduction: The most important aspect of any study on biodiversity (either plant or animal diversity) is to select some representative plots & then record the number of all plants or animals lyingwithin the plot & at last calculating the average diversity index from the recorded observations. "Quadrate Study" is one of the most familiar and useful tool in this regard.

What is a Quadrat? - Quadrate is well defined geometric structure which is further subdivided into sub-quadrate and is useful for measuring the relative number of plants & animals in specific habitat.

The most useful shape of a quadrate is square, but it can be a triangular or circle.

According to my animal of interest the size of the Quadrat also varies, as we are studying dragonflies here, we have used 100 sq. ft. as a unit of Quadrat.



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QUADRAT STUDY OF PLANT SPECIES IN KULDIHA FOREST

Place : Kuldiha forest in the Balasore district of Odisha.

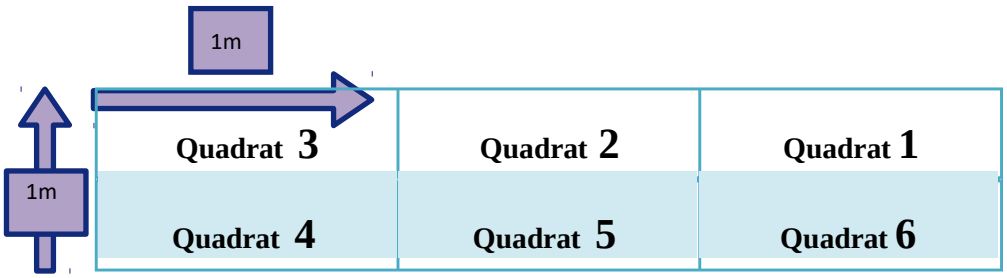
Date : 12.01.18

Time :4:00 pm

Area of quadrate : It was a cm arid grassland

Requirements :

- **Wooden quadrate frame(1m2)**
- **Rope**
- **Measuring tape**
- **Field note book**
- **Pocket lens, pen, pencil**



Methods:

4. Quadrate was formed by the help of rope measuring and 1m long wooden stick in a selected area.
5. The quadrate having 6m2 area which were divide 6 equal sub-quadrate which had the length of area 1m2.
6. Then the species variety of the floral diversity were required.

Name of the specimen	Quadrat 1	Quadrat 2	Quadrat 3	Quadrat 4	Quadrat 5	Quadrat 6	Total no. of individuals	Total no. of specimen
Specimen A	2	0	1	0	0	0	3	67
Specimen B	1	5	0	3	3	0	12	
Specimen C	0	2	2	0	1	0	5	
Specimen D	8	3	2	2	1	8	24	
Specimen E	2	3	7	3	0	2	17	
Specimen F	0	3	1	0	0	2	6	

Simpson's index, $D_S¿\sum_{i=0}^{n}\frac{¿(¿-1)}{N(N-1)}$

Where, n= Total no. of individuals of the species

N= Total no. of individuals of the all species(Total species)

$D_S¿\sum_{i=0}^{n}\frac{¿(¿-1)}{N(N-1)}$

¿ $\frac{3(3-1)}{67(67-1)}+$

$\frac{12(12-1)}{67(67-1)}+\frac{5(5-1)}{67(67-1)}+\frac{24(24-1)}{67(67-1)}+\frac{17(17-1)}{67(67-1)}+\frac{6(6-1)}{67(67-1)}$

=0.00135+0.0298+0.00452+0.124+0.0615+0.00678 =0.22795

$\frac{1}{Ds}=\frac{1}{o.22795}$ 4.386

Frequency, Density and Abundance of species:

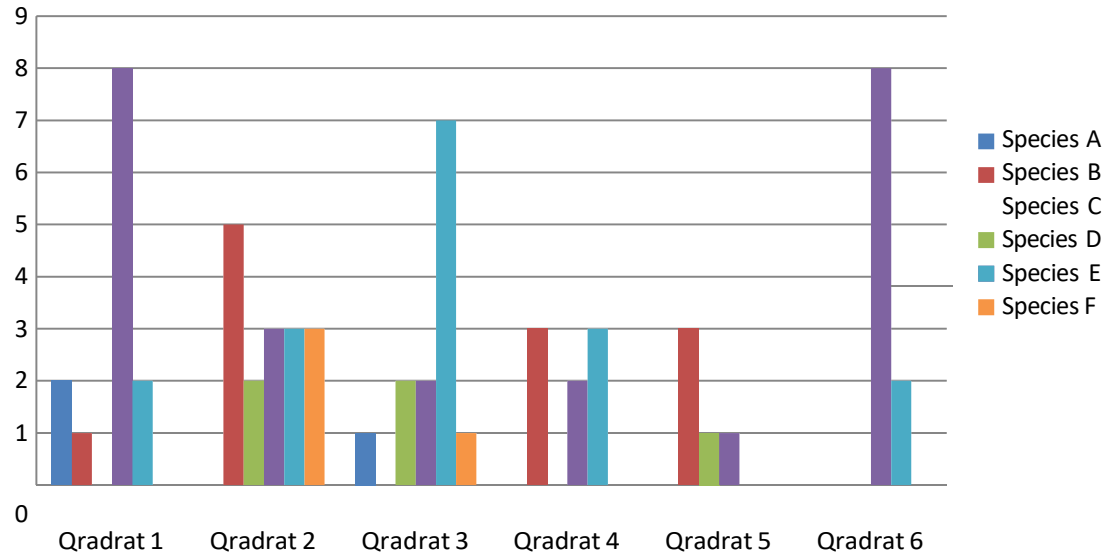
$$\text{Frequency}(\%)=\frac{Total\,no.\,of\,Quadrates \in which\,species has\,occurred}{Total\,no.\,of\,Quadrate\,study}\times 100$$

$$\text{Density}=\frac{Total\,no.\,of\,individuals\,of\,the\,species}{total\,no.\,of\,Quadrate\,studied}$$

$$\text{Abundance}=\frac{Total\,no.\,of\,individuals\,of\,the\,species}{Total\,no.\,of\,Quadrates \in which\,species\,has\,occurred}$$

SL.No.	Name of species	Total no. of species	Total no. of quadrates in which species occured	Total no. of quadrate studied	Density	Abundance	Frequency
1	Species A	3	2	6	$\frac{3}{6}=0.5$	$\frac{3}{5}=1.5$	$\frac{2}{6}\times 100=33$
2	Species B	12	4	6	$\frac{12}{6}=6$	$\frac{12}{4}=3$	$\frac{4}{6}\times 100=66$
3	Species C	5	3	6	$\frac{5}{6}=0.83$	$\frac{22}{5}=1.66$	$\frac{3}{6}\times 100=50$
4	Species D	24	6	6	$\frac{24}{6}=4$	$\frac{68}{6}=4$	$\frac{6}{6}\times 100=10$
5	Species E	17	5	6	$\frac{17}{6}=2.83$	$\frac{37}{6}=3.4$	$\frac{5}{6}\times 100=83$
6	Species F	6	3	6	$\frac{6}{6}=1$	$\frac{4}{1}=2$	$\frac{3}{6}\times 100=16$

QUADRAT STUDT AT KULDIHA FOREST



BIRD WATCHING AT KULDIHA FOREST

Place: **Kuldiha forest**
Date: **13.1.18**
Time: **11:30 am**

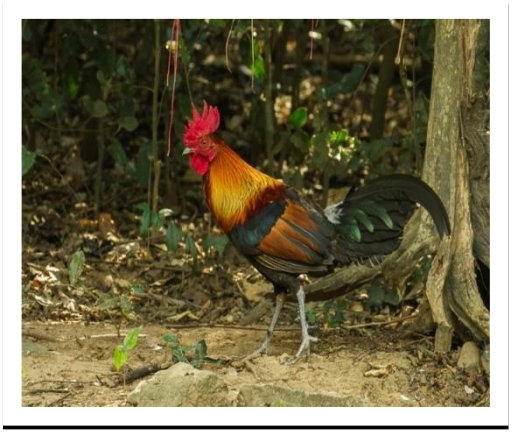
1. **Jungle babblers**

- Scientific name: Turdoides striata

- Description:
  - ➢ Overall grey-brown babbler.
  - ➢ Whitish iris, stout yellow bill, short dark eye brow.
  - ➢ Under parts paler with some greyish streaking on breast.

2. **Red jungle fowl**

- Scientific name: Gallus gallus



- Description:
  - ➢ The head of the cock has ear-wattles and red comb.
  - ➢ The neck is yellow, with a brightly reddish back.
  - ➢ The underparts are dark with grey feet, while the arched tail and wing features are a glossy green.
  - ➢ One of the distinguishing feature of the red junglefowl is the white patch at its rum

3. Common iora

- Scientific name: Aegithina tiphia

- Description:
  - ➢ Ioras have a pointed and notched beak with a culmen that is straight.
  - ➢ Wings are black with white wing bars.
  - ➢ Underparts are bright yellow, with large white features on the flanks.
  - ➢ Tail is blackish, rump is greenish, eyes are black, legs and feet are slate blue-grey.

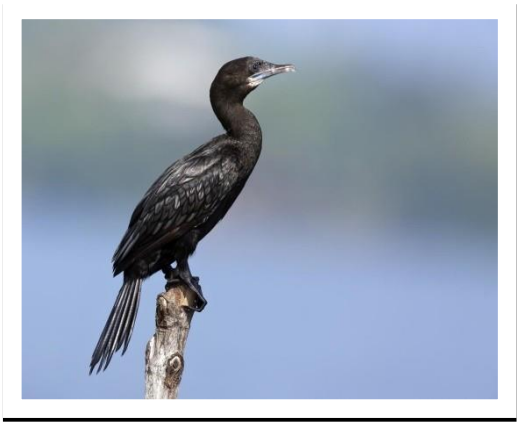
4. Red vented bulbul

- Scientific name: Pycnonotus cafer

- Description:
  - ➢ Dark sooty-brown upperparts.
  - ➢ Pale edges of the feathers on back and breast give scaly appearance.
  - ➢ Glossy black head with slight crest, white rump and bright red vent distinctive.

5. Little cormorant

- Scientific name: Microcarbo niger



- Description:
  - ➢ Small glossy black cormorant with few white plumes.
  - ➢ Short thick neck
  - ➢ Breeding adult with some white spots on face; dark eyes, gular skin and face.
  - ➢ Short silky white crest on back of head.

6. Indian pond heron

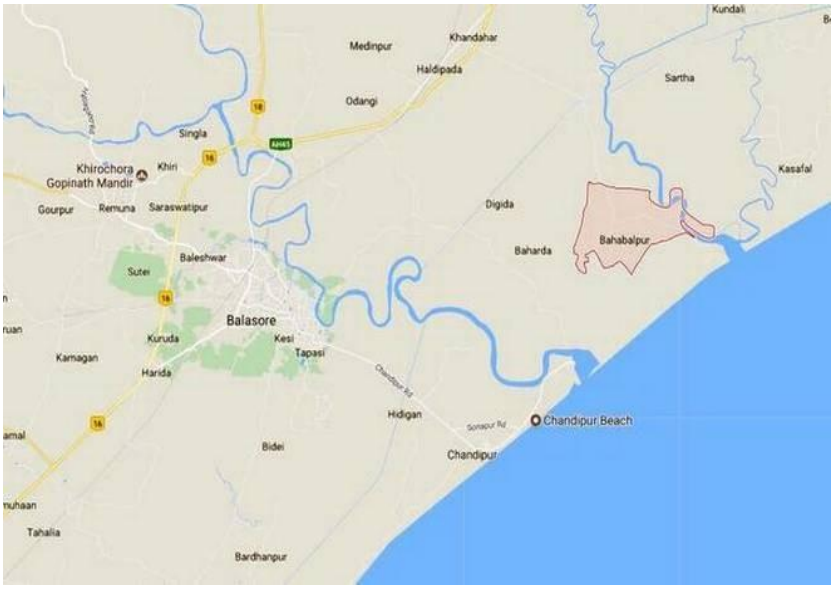
- Scientific name: Ardeola grayii

- Description:
  - ➢ They appear stocky with a short neck, short thick bill and buff-brown back.
  - ➢ In summer, adults have long neck feathers. Its appearance is transformed from their dill colours when they take to flight, when the white of the wings makes them very prominent.
  - ➢ During breeding seasons, there are records of individuals with red legs.

FIELD STUDY AT CHANDIPUR

ABOUT CHANDIPUR

Chandipur, also known as **Chandipur-on-sea**, is a small sea resort in Baleswar District, Odisha, India. The resort is on the Bay of Bengal and is approximately 16 kilometers from the Baleswar Railway Station. The beach is unique in that the water recedes up to 5 kilometers during the ebb tide. Due to its unique circumstances, the beach supports bio-diversity. Horseshoe crab is also found here on the beach towards Mirzapur, the nearby fishing market and community at the confluence of the Budhabalanga River(Balaramgadi). It is a suitable picnic spot. One of Odisha Tourism's Panthanivas (guest house) is situated here.



Geography:

Chandipur is located at 21°28′N 87°01′E / 21.47°N 87.02°E. It has an average elevation of 3 m (9.8 ft). This town is 51.330 acres (0.20773 km²) in size.

Normal Indian weather

In summer the temperature is 25–40 degrees Celsius, but in winter it's 17–26 degree Celsius. Nov–Mar is the suitable time for travelling here.

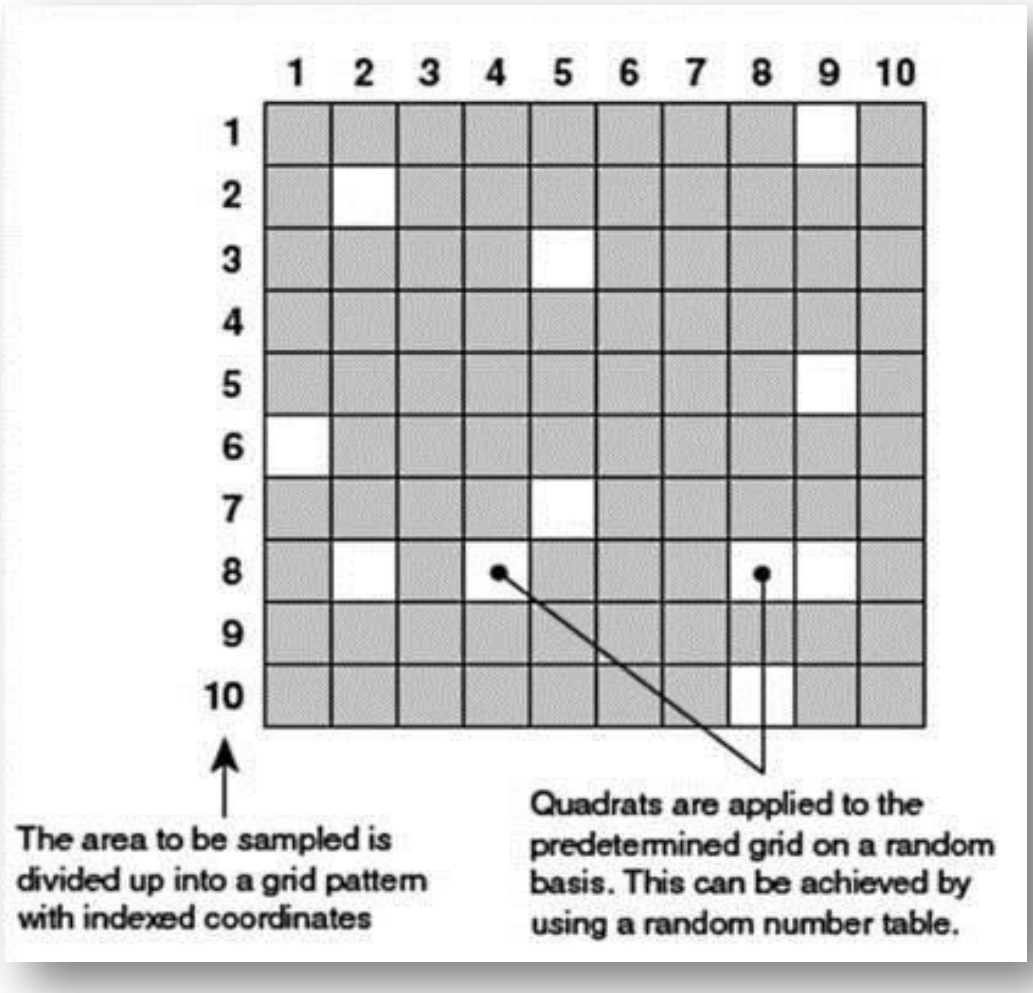
A NOTE ON QUADRAT STUDY:

Introduction: The most important aspect of any study on biodiversity (either plant or animal diversity) is to select some representative plots & then record the number of all plants or animals lyingwithin the plot & at last calculating the average diversity index from the recorded observations. "Quadrate Study" is one of the most familiar and useful tool in this regard.

What is a Quadrat? - Quadrate is well defined geometric structure which is further subdivided into sub-quadrate and is useful for measuring the relative number of plants & animals in specific habitat.

The most useful shape of a quadrate is square, but it can be a triangular or circle.

According to my animal of interest the size of the Quadrat also varies, as we are studying dragonflies here, we have used 100 sq. ft. as a unit of Quadrat.



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QUADRAT STUDY OF CRAB HOLES IN CHANDIPUR

Place :Chandipur

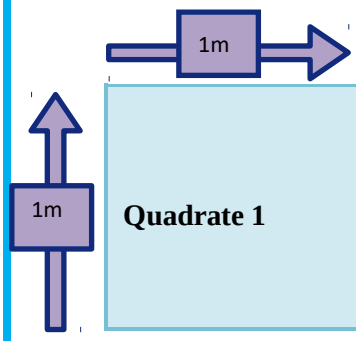
Date : 13.01.18

Time :4:50 pm(In high tide);5:30pm(In low tide)

Area of quadrate : It was a cm arid grassland

Requirements :

- **Wooden quadrate frame(1m2)**
- **Rope**
- **Measuring tape**
- **Field note book**
- **Pocket lens, pen, pencil**



Quadrate 1	Quadrate 2	Quadrate 3	Quadrate 4	Quadrate 5

STUDY IN HIGH TIDE ZONE [TIME:4:50 PM]							
Name of specimen	**Quadrate 1**	**Quadrate 2**	**Quadrate 3**	**Quadrate 4**	**Quadrate 5**	**Total no. of individual**	**Total no. of species**
Big crab holes	10	8	12	15	11	56	139
Small crab holes	21	11	21	14	16	83	

STUDY IN LOW TIDE ZONE [TIME:4:50 PM]							
Name of specimen	**Quadrate 1**	**Quadrate 2**	**Quadrate 3**	**Quadrate 4**	**Quadrate 5**	**Total no. of individual**	**Total no. of species**
Big crab	9	2	6	7	12	36	

holes			12	20		110
Small crab holes	16	5			21	74

Simpson's index, $D_S ¿ \sum_{i=0}^{n} \frac{¿(¿-1)}{N(N-1)}$

Where, n= Total no. of individuals of the species

N= Total no. of individuals of the all species (Total species)

In High Tide, $D_S ¿ \sum_{i=0}^{n} \frac{¿(¿-1)}{N(N-1)}$

$$= \frac{83(83-1)}{139(139-1)} + \frac{56(56-1)}{139(139-1)}$$

$$=0.354+0.160 \quad =0.514$$

$$\frac{1}{Ds} = \frac{1}{0.514} = 1.945$$

In Low Tide,

$$D_S ¿ \sum_{i=0}^{n} \frac{¿(¿-1)}{N(N-1)}$$

$$D_S = \frac{74(74-1)}{110(110-1)} + \frac{36(36-1)}{110(110-1)}$$

$$= 0.450 + 0.105$$

$$= 0.555$$

$$\frac{1}{Ds} = \frac{1}{0.555} = 1.801$$

Frequency, Density and Abundance of species:-

$$\text{Frequency}(\%) = \frac{Total\,no.\,of\,Quadrates \in which\,species has\,occurred}{Total\,no.\,of\,Quadrate\,study} \times 100$$

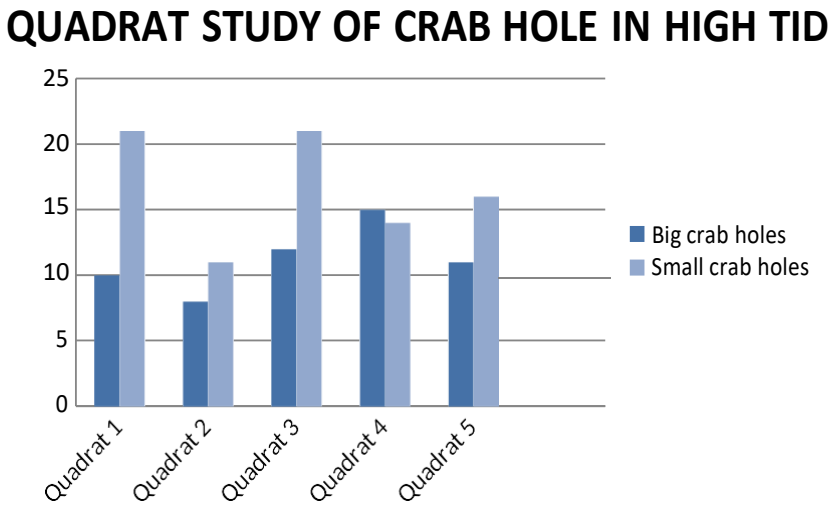
$$\text{Density} = \frac{Total\,no.\,of\,individuals\,of\,the\,species}{total\,no.\,of\,Quadrate\,studied}$$

$$\text{Abundance} = \frac{Total\,no.\,of\,individuals\,of\,the\,species}{Total\,no.\,of\,Quadrates \in which\,species\,has\,occurred}$$

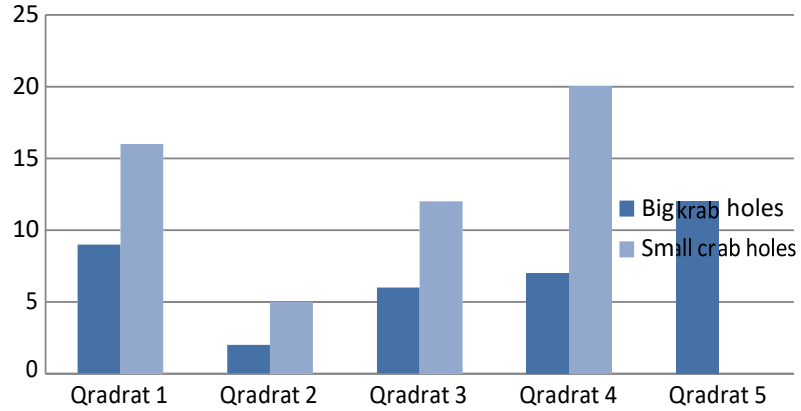
High Tide						
Name of species	**Total no. of species**	**Total no. of quadrate in which species occur**	**Total no. of quadrate studied**	**Density**	**Abundance**	**Frequency**
Big crab holes	56	5	5	$\frac{83}{5} = ¿16.$	$\frac{83}{5} = ¿11.2$	$\frac{5}{5} = ¿100\%$

				2		
Small crab holes	83	5	5	$\frac{56}{6}$ =¿16.6	$\frac{56}{5}$ =¿16.6	$\frac{5}{5}$ ×100=¿100%

Low Tide						
Name of species	**Total no. of species**	**Total no. of quadrate in which species occur**	**Total no. of quadrate studied**	**Density**	**Abundance**	**Frequency**
Big crab holes	36	5	5	$\frac{36}{5}$ =¿7.2	$\frac{36}{5}$ =¿7.2	$\frac{5}{5}$ =¿100%
Small crab holes	74	5	5	$\frac{74}{6}$ =¿7.2	$\frac{74}{5}$ =¿14.8	$\frac{5}{5}$ ×100=¿100%



QUADRAT STUDY OF CRAB HOLES IN LOW TIDE



PROCEDURE FOR SEA WATER ANALYSIS

A. DETERMINATION OF FREE CO_2 IN WATER

PRINCIPLE:-

Free carbon dioxide (CO_2) in water sample can be measured by titrating the test sample against a strong alkaline (pH=8.3) where all free CO_2 molecules in the test sample is converted into bicarbonate.

REACTIONS:-

$2NaOH+CO_2=Na_2CO_3+H_20$

$Na_2CO_3+H_2O+CO_2=2NaHCO_3$

MATERIALS NEEDED:-

- Apparatus:
    1) Burette and burette stand
    2) Conical flask
    3) Stoppered bottle for sample water collection
    4) Reagent

- Reagents:
    1) 1/44 (N) NaOH solrtion
    2) Phenolphthaline indicator

PROCEDURES:-

- Water samples are collected in different ways for analysis. For the estimation of dissolver gases, mixing with air or bubbling is avoided. Water may be collected in a large beaker or in a plastic bucket and transformed to a sampling bottle by a siphon tube. CO_2 measurement should be done immediately because it is liable to escape easily from the sample.
- 50ml of a water sample was taken in a conical flask.
- A few drop of the phenolphthaline indicator were added to the sample.

- The flask was placed against a white back ground and if the colour of water turned pink at first, there is no free co_2 in it.
- If the sample remained colourless, then it was tritated against N/44 NaOH. At the end point a faint pink colour appeared and the burette reading was noted.

PRECAUTIONS:

1) Strictly avoid bubbling during collection of test water.
2) Prevent agitation of the collected sample in the transmit.
3) The surface of the test sample must be covered as far as possible during titration.

OBSERVATION:

❖ **TABLE :1**

Place: Chandipur
Time: 5:30pm
Date: 13.01.18

No.of observation	Sample taken(ml)	Burette observation(ml)		Difference(ml)	Mean(ml)
		Initial	**Final**		
1	50	-----	-----	------	------
2	50	-----	-----	------	
3	50	-----	-----	------	

CALCULATION:-

$$\text{Total free } co_2 = \frac{ml\ of\ NaOH \times Normality\ of\ NaOH \times 1000 \times 44}{ml\ of\ sample\ taken\ for\ titration}$$

Where, Normality of NaOH= 1/44, 44= Equivalent weight of NaOH

$$\text{Total free } co_2 = \frac{ml\ of\ NaOH \times Normality\ of\ NaOH \times 1000 \times 44}{ml\ of\ sample\ taken\ for\ titration}$$

=Not found

INFERENCE:-

Free CO_2 content of water sample is not found.

B. DETERMINATION OF DISSOLVED O_2 IN WATER

PRINCIPLE:-

By chemical experiment it is known that manganoussulphate reacts with sodium or potassium hydroxide to produce white precipitate of $Mn(OH)_2$ [Manganese hydroxide]. This $Mn(OH)_2$ reacts with oxygen in alkaline medium and oxidized to form brown coloured manganese oxihydrate. This oxidation reaction depends on the amount of oxygen present in water. In concentrated acid medium (H_2SO_4) iodide ions (I^-) reduces manganese and itself is converted into molecular I_2. The amount of free iodine = Amount of O_2 in the sample. The amount of the iodine is determined by titration of thiosulphate solution where starch is used as indicator.

CHEMICAL REACTIONS:-

$MnSO_4 + 2NaOH = Na_2SO_4 + Mn(OH)_2$ [White ppt.]

$2Mn(OH)_2 + O_2 = 2MnO(OH)_2$ [Brown ppt.]

$MnO(OH)_2 + 4NaHSO_4 + 2KI = I_2 + MnSO_4 + K_2SO_4 + 2Na_2SO_4 + 3H_2O$

$I_2 + 2Na_2S2O_4 = 2NaI + Na_2S_4O_6$

MATERIALS REQUIRED:-

- Apparatus:
  1) Measuring cylinder
  2) 10ml pipette
  3) Conical flask(250ml)
  4) Stoppered reagent bottle(250ml)
  5) Burette with stand
- Reagents:

1) 1)Alkaline iodide
2) Manganous sulphate
3) 0.025(N) Sodium thiosulphate
4) Concentrated H_2SO_4
5) 1% Starch solution(Indicator)

PROCEDURE:-

- 250 ml of water was collected in a bottle whose stopper can be operated under water.
- ml of alkaline iodide and 1 ml of MnSO4 is added to the sample water.
- The bottle was closed tightly and the solution was mixed thoroughly, kept for a while. The yellowish brown ppt. appeared at the bottom of the bottle and the supernatant was transparent.
- Then 1 ml of concentrated H2SO4 was added to it by a pipette. Again the solution was mixed thoroughly.

- Precipitate was dissolved and the solution turned light brown due to the presence of molecular iodide.
- 50 ml of the treated sample solution was taken in a conical flask and 2-3 drops of starch solution was added to the sample, the solution turns blue.
- 0.025 (N) $Na_2S_2O_3$ solutions was taken in the burette for titration. The reading was taken before titration starts and then titration was done till the blue colour disappears. Again the final burette reading was taken.
- This process was repeated thrice to observe better result.

PRECAUTIONS:

- Care should be taken to avoid exposure of the sample to air while collecting the sample.
- The sample should not be agitated before fixation.
- The surface of the sample exposed to air during titration should be kept as well as possible.
- The starch indicator solution must be freshly prepares before the experiment.

OBSERVATION:-

Place: Panchalingeswar
Time: 5:30pm
Date: 13.01.18

No.of observation	Sample taken(ml)	Burette observation(ml)		Difference(ml)	Mean(ml)
		Initial	Final		
1	50	0	1.5	1.5	1.6
2	50	1.5	1.6	1.6	
3	50	3.1	1.7	1.7	

CALCULATIONS:-

$$\text{Dissolved Oxygen(mg/lit)} = \frac{V1 \times N1 \times E \times 1000}{V4 \times \frac{(V2 - V3)}{V4}}$$

Where,

V_1= Volume of titrate

V_2= Volume of water

V_3= Volume of alkaline iodide and $MnSO_4$

V_4= Volume of water sample used for titrate

N= Normality of Na_2S_2O = 0.025

E= Equivalent weight of Oxygen = 8

$$\text{Dissolved Oxygen(mg/lit)} = \frac{V1 \times N1 \times E \times 1000}{V4 \times \frac{(V2 - V3)}{V4}}$$

$$= \frac{3.14 \times 0.025 \times 8 \times 1000}{50 \times \frac{(250-2)}{250}}$$

$$= 12.66 \text{ mg/lit}$$

INFERENCE:

The amount of dissolved O_2 in sample water id 12.66 mg/lit. The amount is much higher than the optimum dissolved O_2 value of fresh water i.e. 5 mg/lit, indicating that water is pollution free. Thus water can support aquatic life and with high capacity of in taking waste water and totally free contamination .Water with high productivity value.

C. Determination of pH in water :

Theory:

Potential of Hydrogen ion or simply; pH is a value on a scale ranging from 0 to 14, which gives a measure of the acidity or alkalinity of a given sample.

In formulative term, pH is the negative logarithm of Hydrogen ion concentration, i.e. pH= log[H^+]; where,[H^+] = molarity of H^+ in the medium under study.

-

Collecting water sample measured by 'Pocket pH tester'.

Observation:

——

Place: Chandipur

Time: 5:30 pm

Date: 13.01.18

No. of observation	pH value	Mean
1.	8	8
2.	8	
3	8	

Inference:

pH of water sample from Chandipur is 8 (basic).

BIRD WATCHING AT CHANDIPUR

Place: Chandipur
Date: 13.1.18
Time: 4:00 pm

1. **Black-tailed godwit**

   - Scientific name: Limosa limosa
   - Description:

     - ➢ It is a large wader with long bill, neck and legs.
     - ➢ During breeding season, the bill has a yellowish or orange-pink base and dark tip; the base is pink in winter.
     - ➢ The legs are dark grey, brown or black.
     - ➢ In flight, its black and white wingbar and white rump can be seen readily.

2. **Terek sandpiper**

   - Scientific name: Xenus cinereus
   - Description:

     - ➢ Its long upcurved bill- somewhat reminiscent of an avocet's, but not as strongly curved- marked it very distinctive.
     - ➢ It is a small dumpy sandpiper with short orange legs.
     - ➢ The long slightly up-turned bill is orange at the base.
     - ➢ The body is brownish-grey above and on the sides of the breast, white below.

CONCLUSION

The excursion ended in a happy note and every number of it, enjoyed the whole tour to their heart's content. This excursion was hundred percent successful to us. Moreover, most of us went for the first time in Panchalingeswar, Kuldiha forest and Chandipur without our parents. These gave us an Opportunity to face and handle various situations.

This special trip will remain evergreen in my memory as long as I live on this.

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Thank
you