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# Practical No - 1

Aim : Survivorship curve

A life table can be represented on a semi - logarithmic paper ( vertical Y-axis is drawn on a logarithmic scale & the horizontal x-axis is drawn on the arithmetic scale.

In this representation the proportion of surviving individual ( $l_x$ ) is plotted on logarithmic scale & age class (x) is plotted on the horizontal axis. This representation is called as survivorship curve.

Their are 3 type of survivorship curves.

Type 1 ( Highly convex curve).

This type of curve is a characteristic of those species in which the mortality rate of the population is low up to the end of their natural life.

These species have low mortality rate throughout their life span.

Many large animal like elephant, deer, human being etc. show type 1 curves

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## Type II Diagonal Curves.

Type - II survivorship curve indicate a population with age - specific constant survivorship. i.e all age group have a constant rate of mortality.

No population in the real world has a constant age - specific survival rate throughout its whole life span.

Animal like hydra, sea gull, reptiles exhibit curve similar to this type of curves.

## Type III Highly concave curve.

It is seen in species with high mortality rate ~~due~~ during early life stages.

Small mammal, many fish, insect, oyster & ~~etc~~ crustacian show this type of survivorship curve.

High mortality occur due to high predation in early stage & adverse environmental condition. Population with this type of curve need high birth rate to maintain constant population size.

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# Practical No - 2.

Aim : Study of population dynamic through numerical problem.

Population size :
The total number of individual in a population at a given time. Population size is affected by birth rate, death rate & migration.

Birth rate (Natality) :
The no. of birth per 1,000 individual in a population in a given year. It may also be expressed as a percentage. Birth rate represent the rate of population inc due to reproduction

Death rate (Mortality) :
The number of death per 1000 individual in a population in a given year. It may be expressed as a percentage. Death rate represent the rate of population decrease due to mortality.

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## Natural Increase Rate.

- The difference b/w the Birth Rate & Death Rate is commonly referred to as the Natural increase rate or Natural population Growth Rate.

- Mortality of turtle

Problem.

The initial population of turtles in a pond was 200 individuals. The population has an annual mortality rate of 15 %. Calc the expected number of death during a period of 5 years.

:

Initial population ($P_0$) = 200

Annual Death Rate (D) = 15% =

time (t) = 5 years.

Expected Number of Death in 5 year.

No. of death = $P_0 \times [1 - (1 - D)^t]$

No. of death = $200 \times [1 - (1 - 0.15)^5]$

$= 200 \times [1 - (0.85)^5]$

$= 200 \times (1 - 0.4437)$

$= 200 \times 0.5563$

$= 111.26$

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* Natural Population Growth Rate.

Problem :

In a country, the birth rate is 15 birth per 1,000 people & the death rate is 8 death per 1,000 people. Calc the natural population Growth Rate.

· Birth Rate = 15 birth per 1,000 people.
Death Rate = 8 death per 1,000 people.
Natural population Growth Rate.
= Birth Rate - Death Rate.
Natural population Growth Rate = (15 - 8)
= 7.

Population Growth of Rabbit.

Problem :

300 rabbit were accidently released on an island from a ship. The annual birth rate of this population is 20% & the death rate is 10%. Calc the population size after 5 yea

Intial population ($P_0$) = 300
Annual birth rate ($B$) = 20% = 0.2
Annual Death rate ($D$) = 10% = 0.1
Time ($t$) = 5 years

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Population after 5 year ($P_5$) can be calc. using the formula.

$$P_5 = P_0 \times (1 + B - D)^t$$
$$P_5 = 300 \times (1 + 0.2 - 0.1)^5$$
$$P_5 = 300 \times (1.1)^5$$
$$P_5 = 300 \times 1.61051$$
$$P_5 = 483.153.$$

- Population Decline of Tiger.

Problem:

A population of tiger start with 200 individual. The annual birth rate is 6% & the annual death rate is 10%. Calc the population size after 20 year.

Intial population ($P_0$) = 200
Annual Birth rate ($B$) = 6% = 0.06
Annual Death rate ($D$) = 10% = 0.10
time ($t$) = 20 years.
after 20 year.

$$P_{20} = P_0 \times (1 + B - D)^t$$
$$P_{20} = 200 \times (1 + 0.06 - 0.10)^{20}$$
$$P_{20} = 200 \times (0.96)^{20}$$
$$P_{20} = 200 \times 0.44200$$
$$P_{20} = 88.400.$$

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# Practical No : 3

Aim : Effect of Migration on Population size

Population size is affected by many factors. Beside birth rate & death rate migration is another imp factor that determine the population of a species. The effect of migration on population size in an area is especially imp. for bird & fish.

- Migration.

The movement of individual from one location to another is called migration. Migration change the size of the source & destination population. It can also change the genetic composition.

Immigration : The movement of individual into a population or area under study is called immigration.

Emigration : The movement of individual out of the population under study is called emigration.

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Net population change or Population Growth
The overall change in population size over a specific period is called net population change or population growth.
It can be.

- Positive
when birth & immigration exceed death & emigration.

- Negative
when death & emigration exceed birth & immigration.

- Stable : when birth equal death & immigration equal emigration.

Population Growth with immigration
Problem :
A population of fish has an initial population of 1000 individual. The annual birth rate is 0.1, the death rate is 0.05 & the immigration rate is 0.03. Calc the population size after 3 year.

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Initial population ($P_0$) = 1000
Annual Birth Rate. (B) = 0.1
Annual Death Rate. (D) = 0.05
Immigration Rate. (I) = 0.03
$\varepsilon$ = 0.00
time (t) = 3 year.

$P_3 = P_0 \times (1 + B - D + I - \varepsilon)^t$

$P_3 = 1000 \times (1 + 0.1 - 0.05 + 0.03 - 0)^3$

$P_3 = 1000 \times (1.08)^3$

$P_3 = 1000 \times 1.259712.$

$P_3 \approx 1260.$

Population Growth with immigration & emigration.

- Problem.

A city start with a population of 100,000 the annual birth rate is 2%, the death rate is 1%, the immigration rate is 0.5% & the emigration rate is 0.3%. Calc the population size after 10 years.

$P_0 = 100,000$
$B = 2\% = 0.02$
$D = 1\% = 0.01$
$I = 0.5\% = 0.005$
$\varepsilon = 0.3\% = 0.003$
$t = 10$ years.

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$$P_{10} = P_0 \times (1 + B - D + I - E)^t$$

$$= 100,000 \times (1 + 0.02 - 0.01 + 0.005 - 0.003)^{10}$$

$$P_{10} = 100,000 \times (1.012)^{10}$$

$$P_{10} = 100,000 \times 1.126691$$

$$P_{10} = 112,669.18.$$

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# Practical No - 4

Aim : Population density & carrying capacity.

Calculation of population size using birth rate, death rate & immigration assume an unlimited availability of resources. As the population increase the resources become progressively scare until the population of species reaches a maximum level.
It is imp. to consider.

## Population Density :

The no. of individual of a species per unit of area or volume is called its population density.

## Carrying Capacity :

The maximum population size that an environment can sustainably support the available resources is called carrying capacity.

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Population Density.

Question : A city has an area of 10 square kilometer & a population of 50,000 people. Calc. the population density of the city.

* Population : 50,000
Area = 100 square Kilometer.
Population Density : Population / Area.
$= \frac{50,000}{100}$
Population density = 500 people per square Kilometer

Population density of Blackbuck.

Question : A population of blackbuck is spread over an area of 600 square Kilometer. The population of blackbuck is 120 individual. Calc the population density of blackbuck.

Population = 120
Area = 600 sq km
Population density = population / Area
population density = $\frac{120}{600}$
$= 0.20$

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# Practical No - 5

Aim : To determine the chronotype by using Morningness - Eveningness Questionnaire (MEQ).

Principle.

The morningness - eveningness Questionnaire (MEQ) was developed by researcher James A Horne & Olov Ostberg in 1976. MEQ has 19 items. It is a self - assessment test & take 10 - 15 minute to complete. It is used to determine whether a person biological clock.

Procedure.

- A morningness - Eveningness Questionnaire (MEQ) is given in the book.
- Read the instruction & answer all ques in the questionnaire.
- Remember that the ques are asking for your preference.
- Assign point to each answer as given in table.
- The total score is converted to a 5 - point. scale : definitely morning type (70 - 86), moderately morning type (59 - 69), neither type (42 - 58), moderately evening type (31 - definitely evening type (16 - 30).

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# Practical No - 6

Aim : Identification of Animals through Pugmarks

- Imprint of impression left by the paws or feet of animals are called pugmarks.
- Pugmarks refer to the footprint of almost all animals but the term is more commonly used to refer to the footprint of carnivore like tiger, lion etc & large animal like elephants.
- The footprint of ungulates like deer & hogs are called hoof prints.
- Impression left behind on soft surface like mud, sand, snow etc have length, breadth & depth. These are called 3D pugmarks.
- Impression left behind on hard surface due to the deposition of dust, blood etc are called 2D pug marks.

Pugmarks of members of cat family.

Cats have retractable claws & claw marks are usually not visible. Claws mark are seen only if the animal is at walking over slippery or very steep ground

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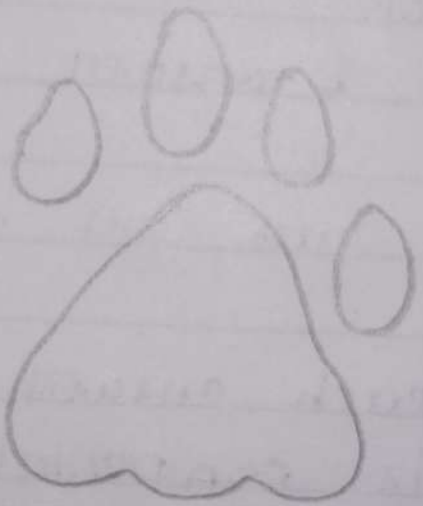

marks of cat

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Pugmarks of member of dog family (Canidae):

Claws marks are visible in the pugmarks of members of dog family because claws are not retractile. The gap b/w the top of the pad & the two middle toe is distinctly more than what is found in cat.

Identifying other Herbivorous Animal from feet marks.

Ungulates with odd number of toes are placed in the order Perissodactyla. eg. horse & donkey have one hoof while rhinaceros has three hoofs. Elephants do not have hoofs

Elephant (Elephas maximus):
Elephant do not have hoof in their foot. They leave large, round, foot impression which are easily identified. The imprint of the front foof is 500 mm long while those of the hind leg are 530 mm long. Usually, 3 toes can be seen in marks of the front foot.

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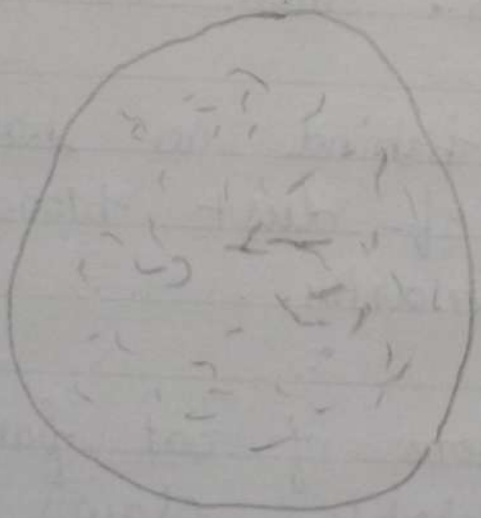
Dog



Elephant

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Horse (Equus caballus):

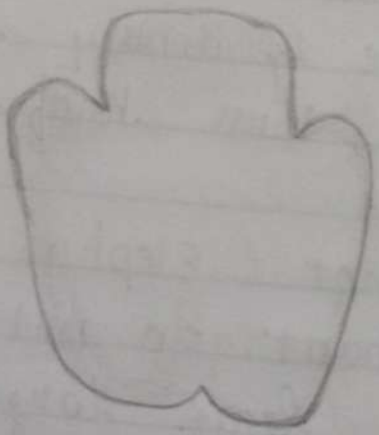
The hoof mark of a horse appear round in shape. A triangular imprint called the frog may be seen in the posterior central part of the hoof mark.

Rhinoceros (Rhinoceros unicornis):

Rhinoceros track are 200-250 mm long. Front feet tracks are circular while hind feet track are more elongated. Three hard horny toes are clearly visible.

Horse

front foot



hind foot

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# Practical No - 7.

Aim : Equipment used in wildlife studies.

- Compass.
- A compass is a device that indicate direction. It is used for navigation & orientation.
- A compass has a plastic or metal casing with a glass cover.
- It has a magnetized needle mounted on a low - friction pivot point.
- the needle can rotate to align with the magnetic north pole of the earth.
- The compass dial show angle in degree. North is 0° & the angle increase clockwise.
- The angle blw the true north & magnetic north is called magnetic declination.
- The compass needle tends to point downward.

Use :

A compass is an invaluable aid in field studies of wild life. It permit scientist to orient map correctly. identify land mark & locate their position in the field. It prevent them from getting lost.

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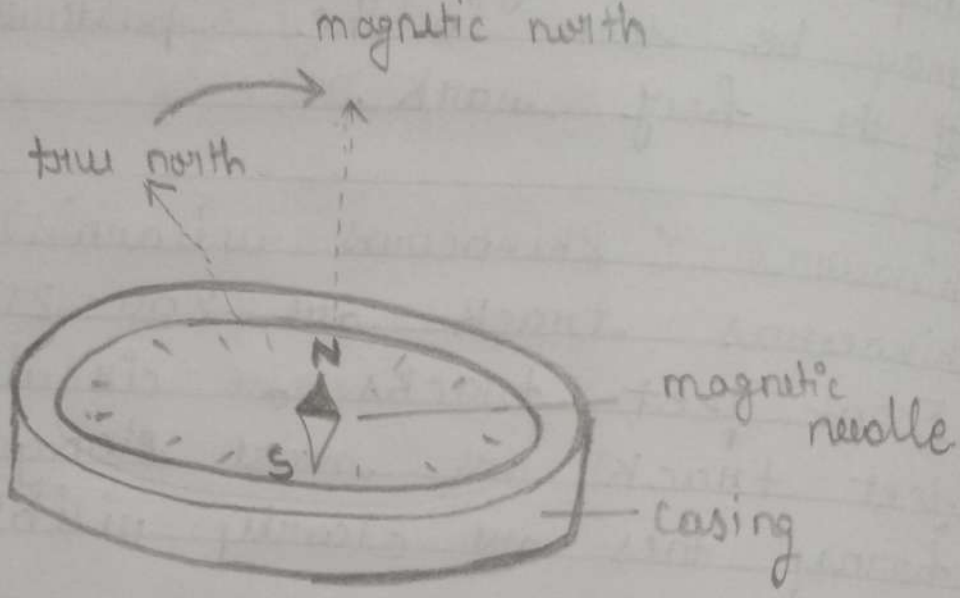
magnetic north
true north
N
S
magnetic needle
casing

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. Binocular.

. Binocular consist of a pair of identical telescope mounted side-by-side. Both telescope are aligned in parallel to produce a single circular image.

. Each eyepiece present a slightly different image to each eye. This produces depth perception.

. Binocular have optical part like objective & eyepiece lens & mechanical parts.

A binocular has 3 main optical parts.

- objective lens assembly.
- Image orientation & correction assembly.
- Eye-piece assembly. lens

. The objective lens assembly lies at the front of the binocular. It collect light from the object & form an image at the image plane.

. the image orientation & correction assembly. usually uses a set of prism. It shorten the optical path & produce an erect image

. The eyepiece lens assembly is present near the user's eye. It mag magnif the image.

. Magnification is fixed & permanent.

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Uses.

A binocular is used to observe wildlife, identify species, study animal behaviour. etc.
Good binocular can help experienced people identify individual animals.

- Spotting scope.
- A spotting scope is a portable telescope used for detailed observation of distant object.
It is used when a magnification higher than ordinary binocular is needed.
- It consist of a single telescopic tube with an objective lens, an internal image-erecting system & a removable eyepiece.
- Spotting scope usually have a point for attaching to a tripod & a control knob. for focus adjustment.
- The eyepieces of spotting scopes are usually interchangeable. can be changed to diffirent ~~mgr~~ magnification.

Uses

Spotting scope are used for studying birds & animal over long distance or for nature watching across open area. They are more powerful than binocular.

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Compact camera.

- Compact camera are also known as Point & shoot camera.
- Thes cameras are extremely easy to use.
- They do not need many user input
- They can be used to shoot video & to share image.
- Give good result under optimum condition.
- They are easy to carry & handle.

- General Purpose camera.
- General purpose camera used for wild life photography may be DSLR ( Digital single Lens Reflex). camera or mirror less camera
- These are relatively low-cost & easily available device.
- The ~~adjust~~ user can adjust brightness, colour & contrast for best picture
- In DSLR camera light from the object to be photographed enter the camera & fall on a mirror. The mirror reflect the light to be viewfinder.
- In mirrorless camera, light from the object fall directly on the sensor. This is used to produce an image on the rear screen or electronic viewfinder.

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Disadvantages

- It is depend on the on the skill of operator.
- A lot of preparation is needed to hide the camera & operator from wild animals.
- These are not suitable for photographing aggressive or secretive animals.
- The camera operator must be present physically to operate the camera.

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# Practical No - 8.

## • Green House Effect

- Greenhouse effect is the process by which radiation from the sun are absorbed by the greenhouse gases & not reflected back into space.

Green House Gases.

A chemical that absorb infrared light from the sun & transform it to heat. & creat green house effect.

$CO_2$, methane ($CH_4$), nitrous oxide ($N_2O$), Ozone, chloro ~~fluoro~~ fluorocarbons. (CFCs) along with water vapour

Causes.

- Burning of Fossil fuel.
- Defarustation.
- Industrial Waste & Landfills.
- Global warming.
- Depletion of Ozone layer.
- Smog & Air pollution.

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# Global Warming Effect

- Global warming is a gradual increase in the earth temperature generally due to the greenhouse effect.

Also refer as the phenomenon of increasing average air temp near the surface of earth.

Causes.

- Cutting down of forest.
- overpopulation.
- use of vehicle.
- Fossil fuel. burning.
-

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# Practical No- 9.

## Pond Ecosystem.

A freshwater pond is a self maintaining & self regulating ecosystem. A pond is a shallow standing water body. It is characterised by quite water & abundant vegetation with thousand of micro-organism, large plant & animals.

## Abiotic component.

These are non-living component of the pond ecosystem. These include inorganic & organic compound such as water, $CO_2$, oxygen, calcium & nitrogen. & many more.

## Biotic component.

Biotic component of a pond ecosystem comprises of producer, consumer & decomposer.

## Producers

Green plant are the producer of pond ecosystem. They synthesise organic compound from simple organic substance such as water, $CO_2$ & mineral in presence of sunlight.

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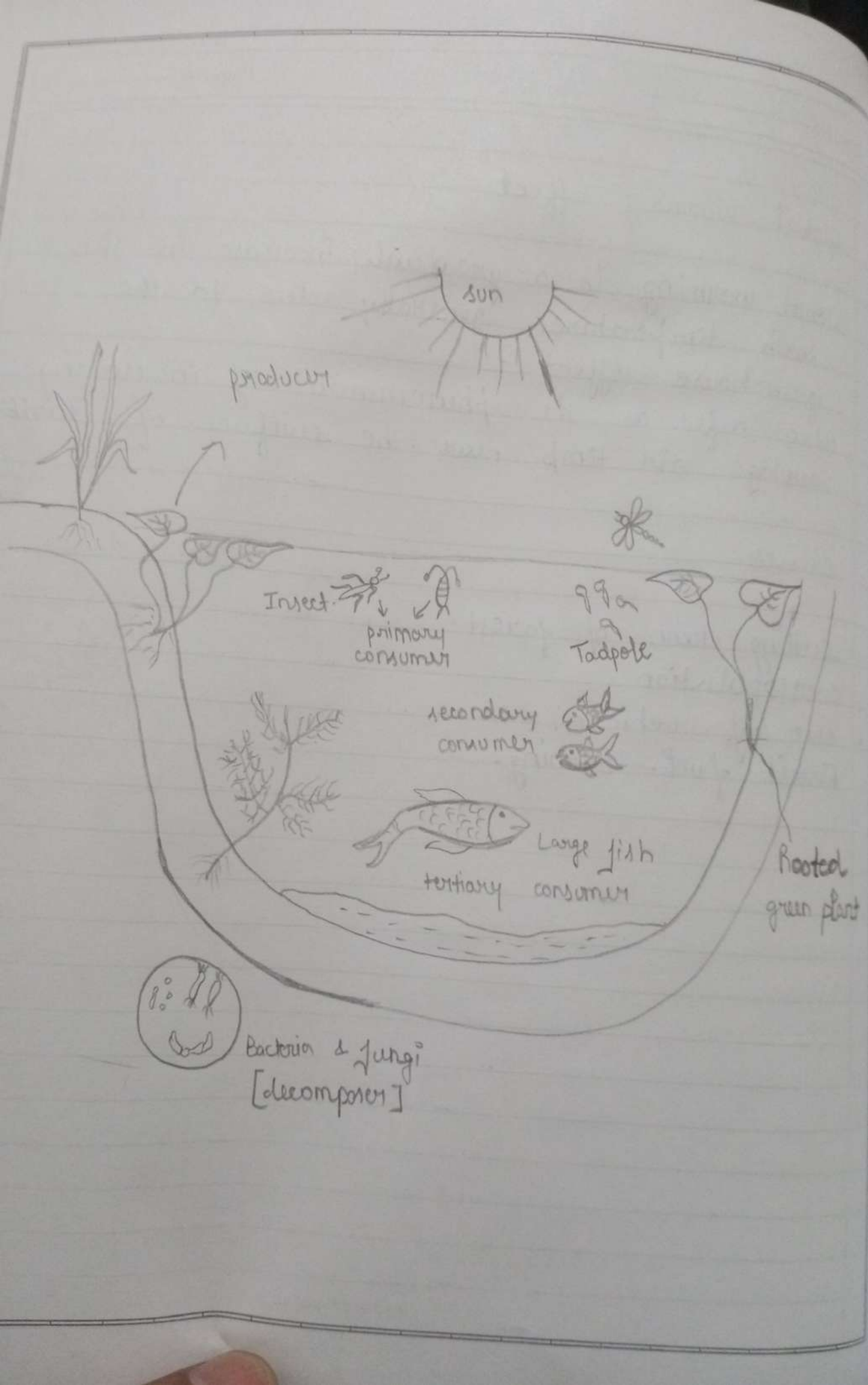
sun
producer
Insect
primary consumer
egg
Tadpole
secondary consumer
Large fish
tertiary consumer
Rooted green plant
Bacteria & fungi
[decomposer]

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there are two type of producer.

- Large rooted plant growing along the bank or floating in shallow water.
- Microscopic plant or phytoplankton include oscillatoria. the phytoplankton are more imp as the producer in the pond than the large plant.

Consumer:
these are heterotrophs which depend for their nutrition on the organic food manufactured by the green plant.
The consumer in a pond are primary, secondary & tertiary consumer.

Primary consumer: These are herbivores feeding directly on living plant or plant remain lying at the bottom of the pond it include zooplankton such as rotifer & some protozoans.

Secondary consumer:
They are carnivorus which feed on the primary consumer. These are mainly insect & small fish.

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Tertiary consumers : These are some large fish & other animal which depend on the secondary consumer.

Decomposer :

The fungi & saprophytic bacteria are come in decomposer.

These decompose the dead bodies of the organism & derive their nourishment.

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