DEFINITION, SCOPE AND DIVISION OF ECOLOGY

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INTRODUCTION

- Ecology is a Greek word which means the study of the habitation of living organisms (oikos=habitation, logos=discourse).
- Some define it as
  - "scientific natural history" or
  - "the science of community population" or
  - "the study of biotic communities".

The term ecosystem was first proposed by A.G. Tansley in 1935

- He defined it as "the system resulting from the in the integration of all the living and non-living factors of environment
- Ecosystem is most preferred where "eco" implies the environment and system implies an interacting , inter-dependent complex

BRANCH OF BIOLOGY

- Ecology till recently was considered in academic circles to be a, which, along with molecular biology, genetics, developmental biology, evolution etc. was by no means always considered as one of the subjects of biological sciences only

- The first naturalist to give a systemized knowledge about the relation existing between living organisms and environment was Buffon. In a series of work in 1749, he stressed on habits and adaptations.

BRANCHES OF ECOLOGY

- Ecological studies focus on how various organisms interact with their environment. There are a number of fields within ecology, either focusing on specific areas of interest or using particular approaches to address ecological problems.

THE SUB-FIELDS OR BRANCHES OF ECOLOGY

- **i. Behavioural Ecology:** • It is concerned with explaining the patterns of behaviour in animals.
- **ii. Physiological Ecology or Eco-Physiology:** • It deals with how organisms are adapted to respond to temperature, maintain proper water and salt balance, balance levels of oxygen and carbon dioxide, or deals with other factors of their physical environment.

- **iii. Molecular Ecology:** • Directly tackle ecological problems is the focus of molecular biology.

- **iv. Evolutionary Ecology:** • evolution on current patterns and human induced changes. It relates to
- how animals choose mates, determine the sex of their offspring, forage for food and live in groups, or
- how plants attract pollinators, disperse seeds, or allocate resources between growth and reproduction.

- **v. Ecosystem Ecology:** The interaction between the biotic and abiotic components called an ecosystem is the sub-field of ecology called ecosystem ecology.
- **vi. Population Ecology:** Population ecology constitutes organisms of the same species living in the same place and same time. It may comprise of the dynamics of a single population of any living thing (earthworm, fox, whale, pine tree etc.) or may focus on how two populations (predator and its prey or parasite and its host) interact with each other.

- **vii. Community Ecology:** • Populations of many different organisms in a particular place are tied to one another by feeding relationships and other interactions. These relationships of interacting populations are called ecological communities and their study is under the purview of community ecology.

- **viii. Landscape Ecology:** • These are of ecological fields whose study requires the synthesis of several other sub-fields of ecology. Landscape ecology is one that emphasizes the interconnections among ecosystems of a region. • The values of landscape ecology are:
- a) It emphasises on larger land areas of interacting ecosystems, i.e., next higher level of organization above the local ecosystem, and •
- b) Its tendency to compartmentalize. We study a lake or forest ecosystem but landscape ecology considers the connections between them. For example, herons forage in the lake, nest in the forest and, thus, the herons move nutrients from water to land.

- **ix. Conservation Biology:** • This sub- field of ecology blends the concepts of genetics with population and community ecology. It takes a landscape approach and is related to the maintenance of biodiversity and the preservation of endangered species.

- **x. Restoration Ecology:** • It relates to the re-establishing of the integrity of natural systems that have been damaged by human activity.

- **xi. Ecotoxicology:** • It is the study of the fate and action of humanmade substances, such as pesticides and detergents, in the natural world. • Ecotoxicology focuses on the way in which humanmade substances affect human health. • Eco-toxicologists often use other animals, such as fish or small invertebrates, as models for the action of the particular toxic substance

Thank you

BIOTIC ENVIRONMENT

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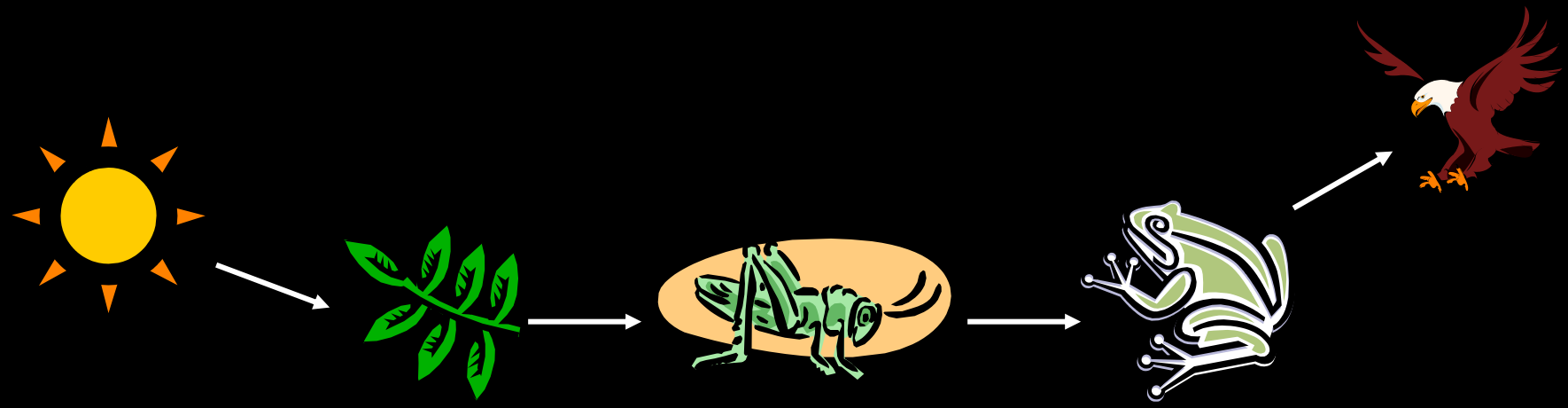
INTRODUCTION

WHAT IS A FOOD CHAIN?

- **A food chain is the path by which energy passes from one living thing to another.**

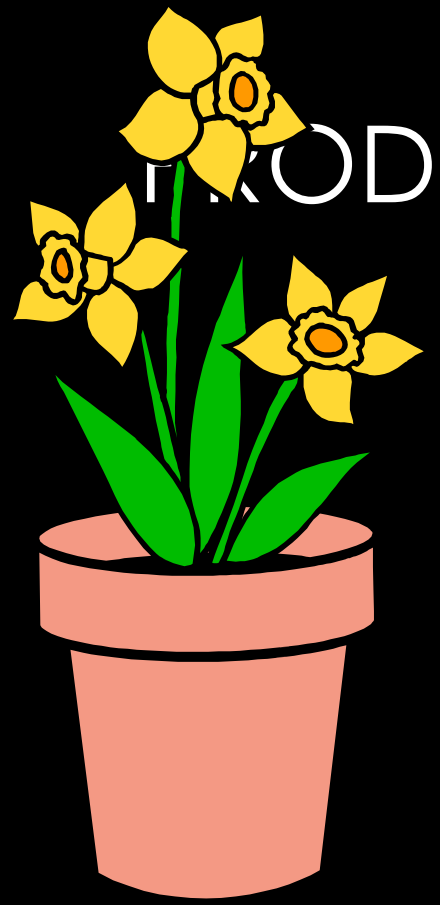


WHAT'S IN A FOOD CHAIN?

- Producers
- Consumers
- Decomposers

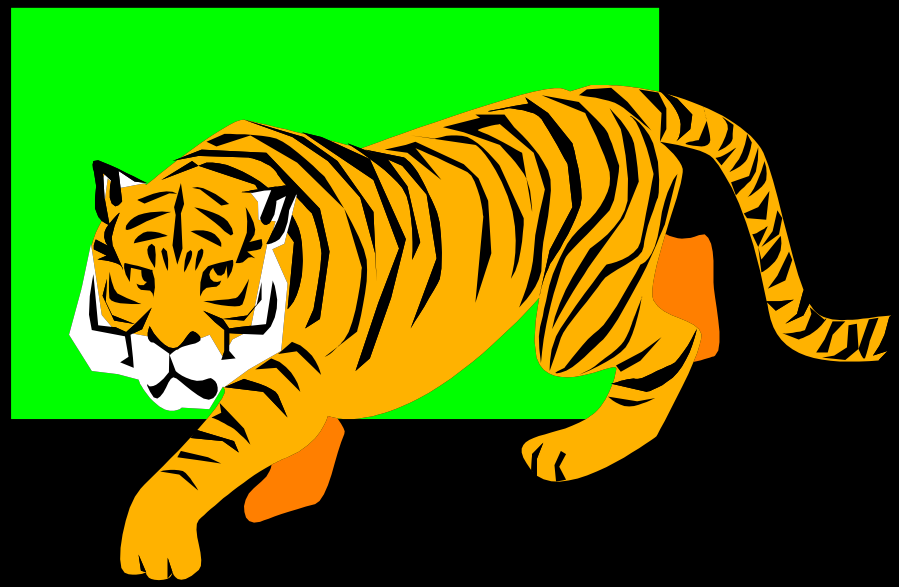
PRODUCERS

- Producers make their own food
- Green plants use energy from the sun to make food
- Producers are on the bottom of the food chain



CONSUMERS

- Consumers hunt, gather, and store food because they cannot make their own.



THREE TYPES OF CONSUMERS

- Herbivores
- Carnivores
- Omnivores

HERBIVORES

- Animals who eat plants such as:
  - grasshoppers
  - rabbits
  - squirrels
  - deer
  - pandas

CARNIVORES

- Animals who only eat other animals such as:
  - tigers
  - lions
  - hawks
  - wolves
  - cougars

OMNIVORES

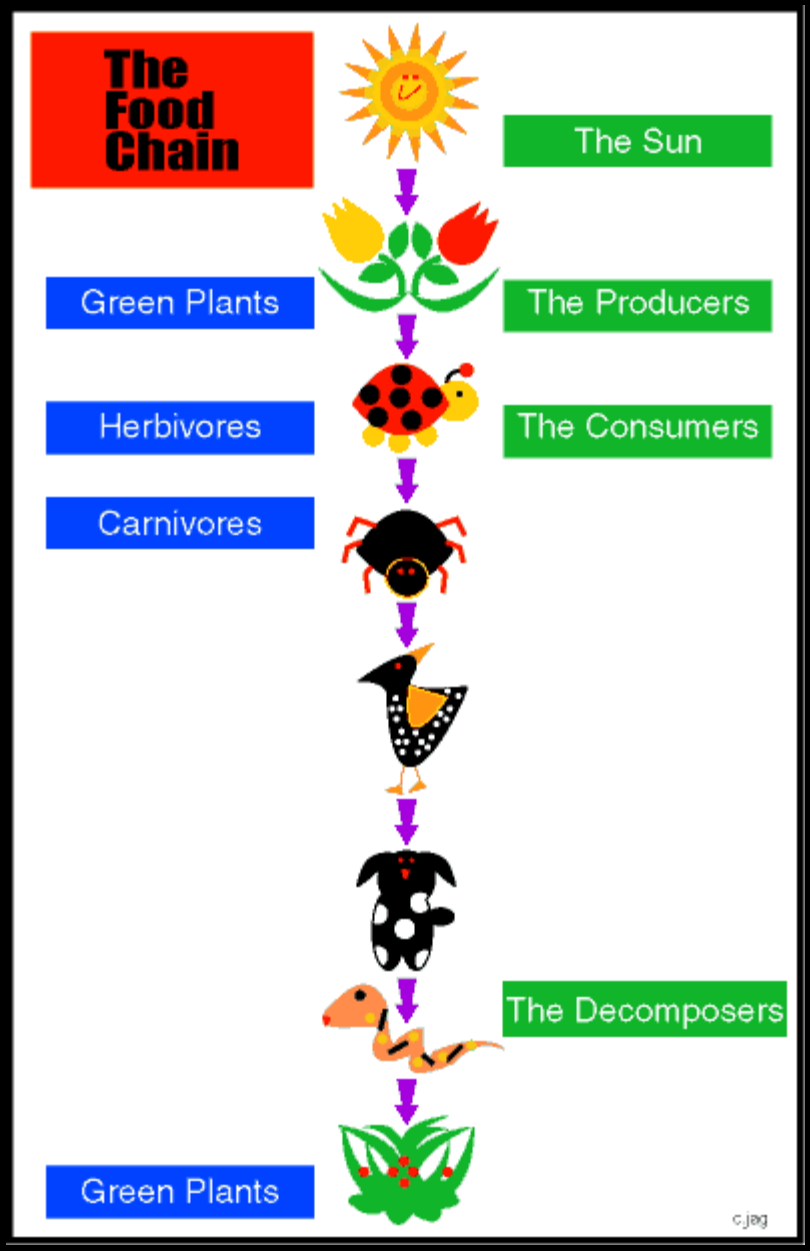
- Animals who eat both plants and animals such as:
  - humans
  - bears

DECOMPOSERS

- Microorganisms that are able to break down large molecules into smaller parts
- Decomposers return the nutrients that are in a living thing to the soil

LET'S LOOK AT A FOOD CHAIN

- A food chain is a simplified way to look at the energy that passes from producers to consumers.



TYPES OF FOOD CHAINS

- **Aquatic- Water-related food chains with sea plants and animals**
- **Terrestrial- Land-related food chains with land plants and animals**

PREDATOR & PREY

- **Predator- An animal that captures and eats other animals**
- **Prey- The animal that is captured and eaten**

FOOD WEBS

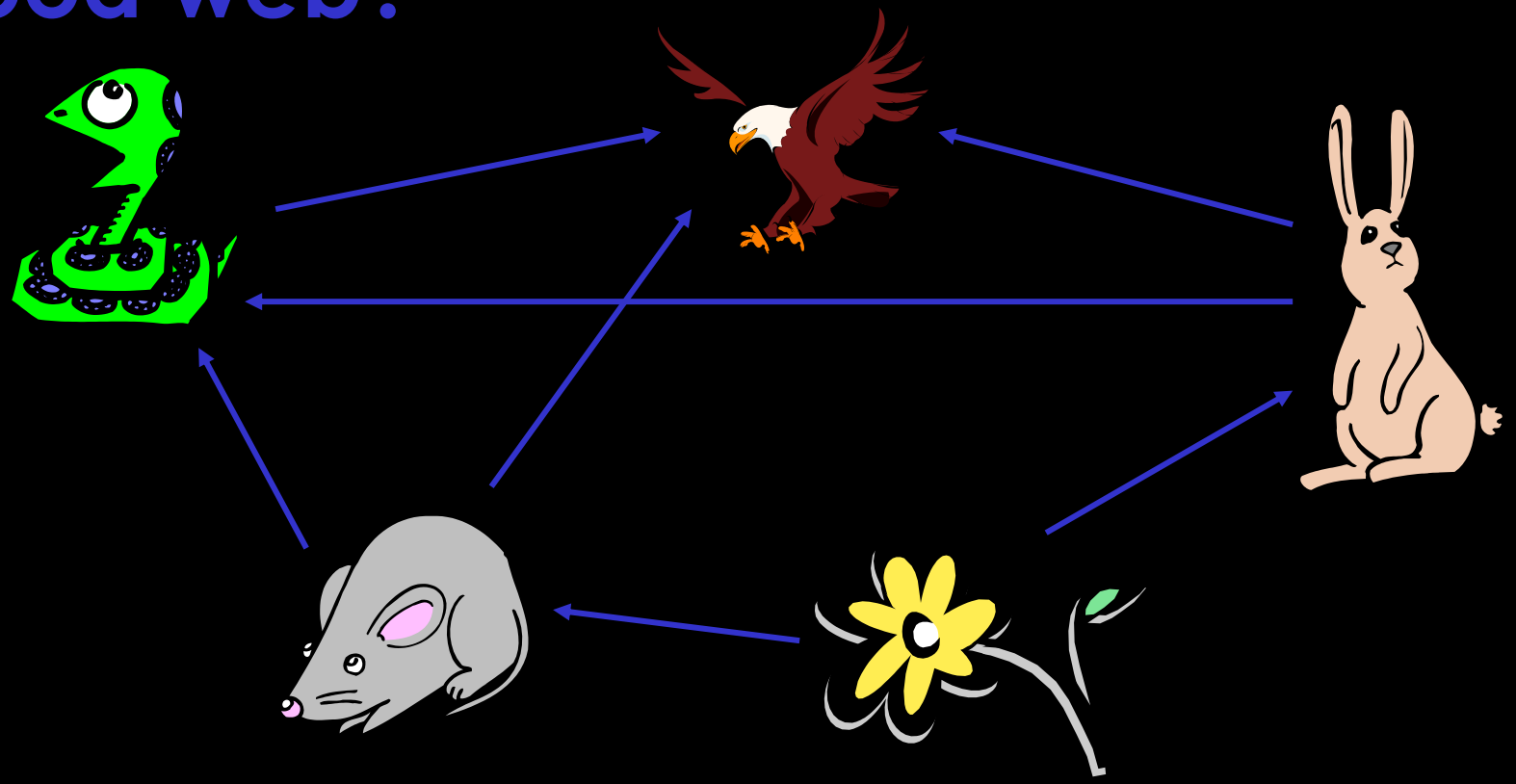
Food Webs are Food Chains that intersect each other. Food webs are what really happens in nature.

WHAT IS A FOOD WEB?

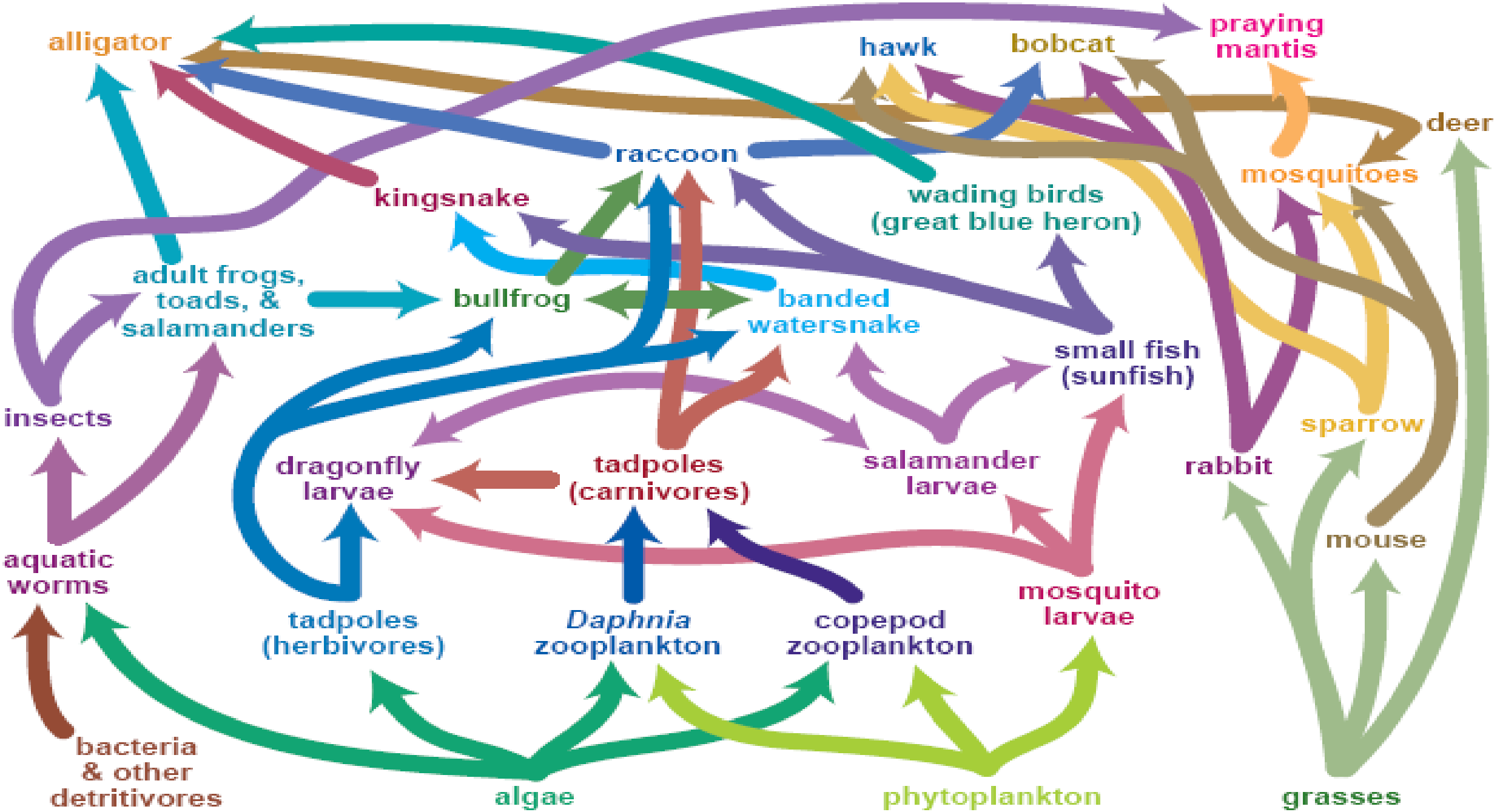
- A more realistic way of looking at the relationship of plants and animals in an environment
- Several food chains linked together
- A predator from one food chain may be linked to the prey of another food chain

FOOD WEBS

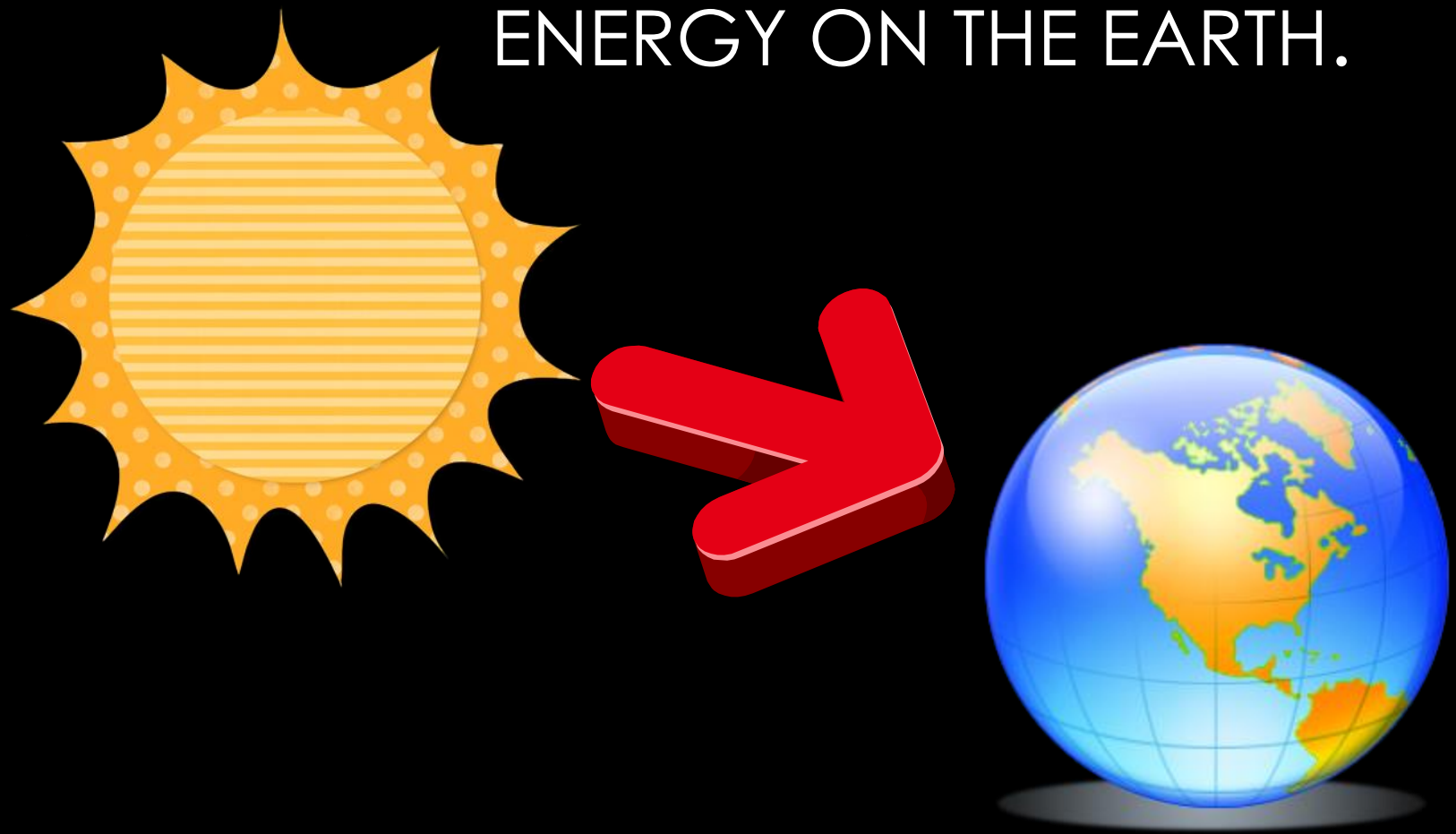
- **How many food chains can you make from this food web?**



A Simplified Food Web

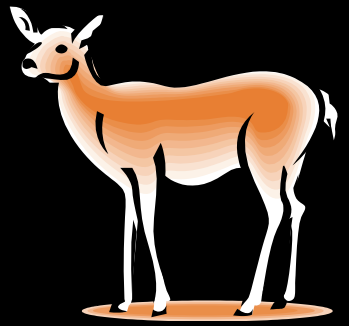


ALL FOOD CHAINS AND WEBS START WITH THE SUN. THE SUN IS THE SOURCE OF ALL THE ENERGY ON THE EARTH.

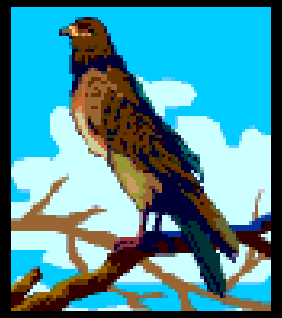


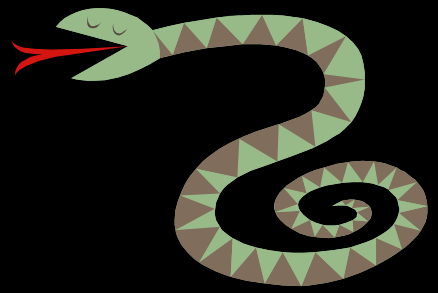
PLANTS ARE PRODUCERS. THEY TURN ENERGY FROM THE SUN INTO SUGARS THAT ANIMALS CAN USE.

INSECTS AND OTHER ANIMALS EAT PLANTS FOR ENERGY. THEY ARE PRIMARY CONSUMERS. THEY ARE HERBIVORES.

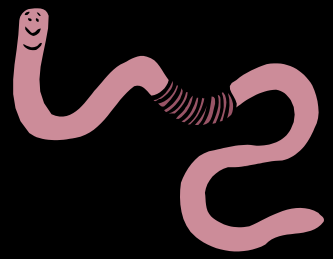


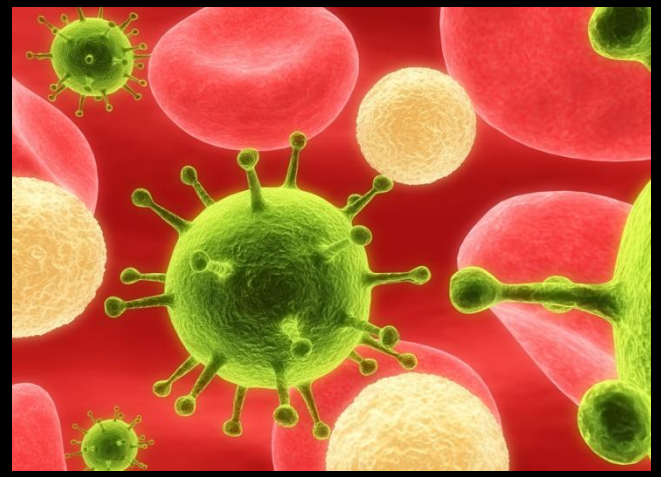
SECONDARY CONSUMERS ARE ANIMALS THAT EAT OTHER ANIMALS FOR ENERGY. THEY ARE CALLED CARNIVORES.





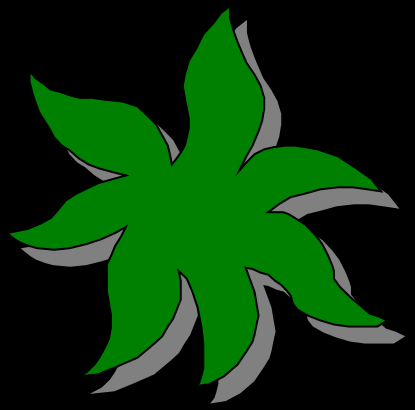
DECOMPOSERS ARE ORGANISMS THAT EAT DEAD THINGS FOR ENERGY.

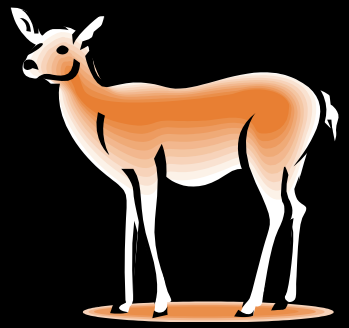




SUMMARY

- Combined food chains make food webs.
- Food webs start with the sun
- Food webs contain producers, consumers, and decomposers.
- We are part of the food web, too!





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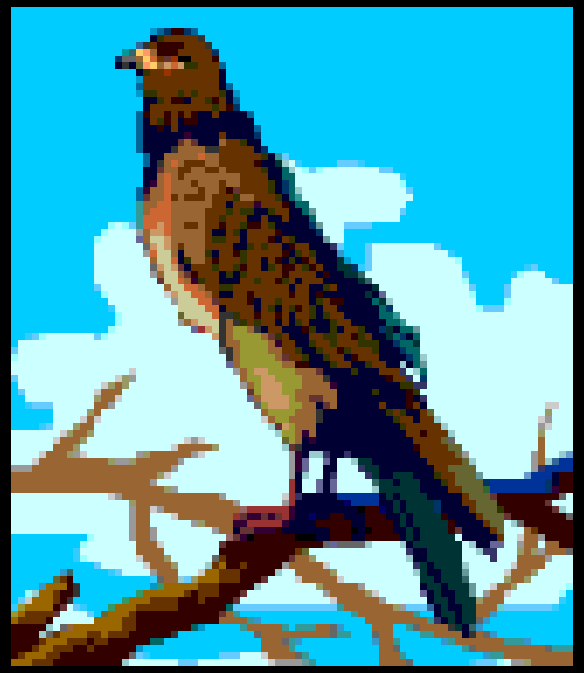

ATMOSPHERE STRATIFICATION

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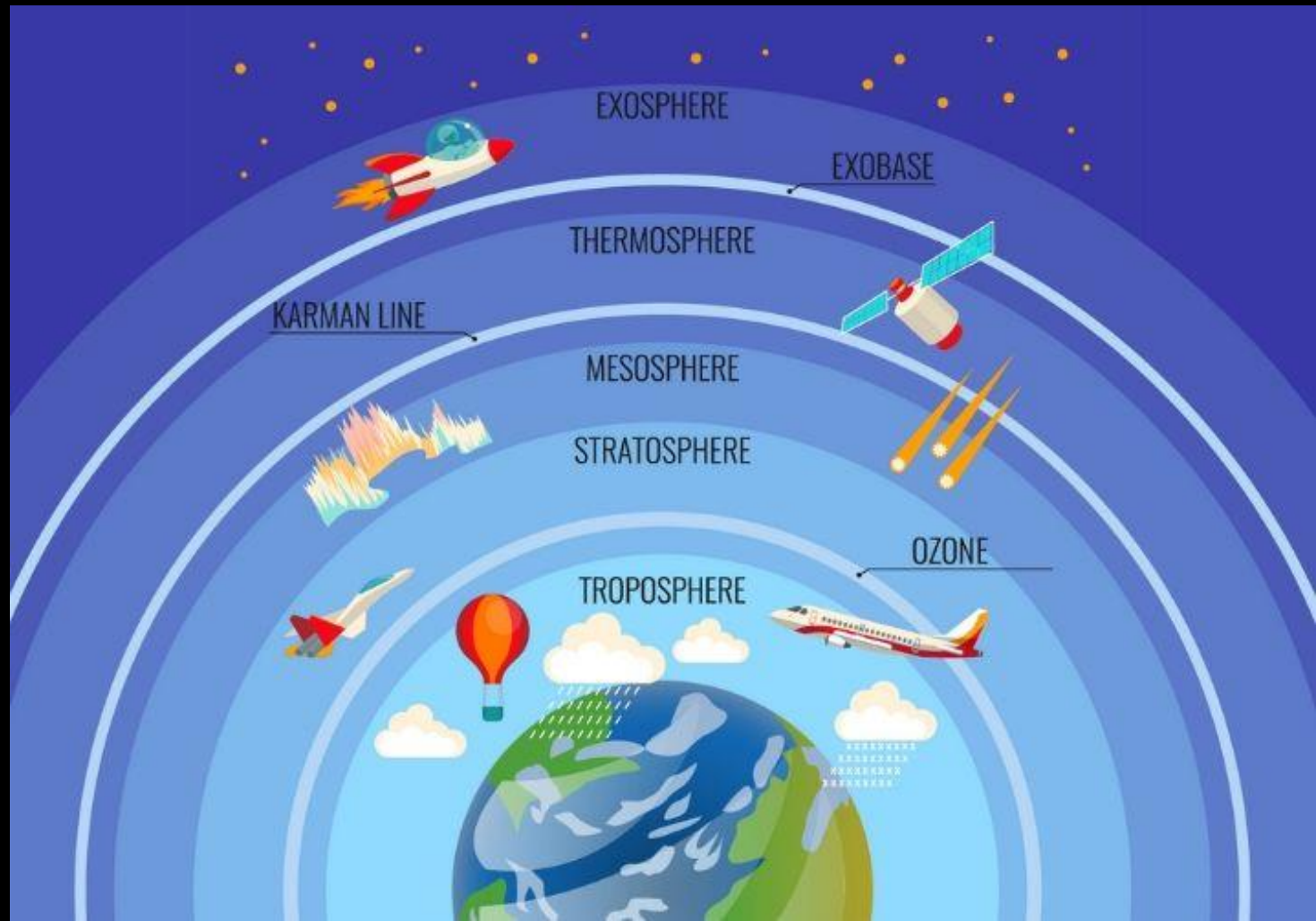
INTRODUCTION

- Our earth is surrounded by a blanket of air known as the atmosphere. The atmosphere is made up of a mixture of gases. If compared to the diameter of the Earth, the atmosphere is very thin.
- Atmosphere is the gaseous envelop of the earth
- It extents upto a height of 400 km from the surface of the earth
- It consists of gases and some solid and liquid particles suspended in it

Our atmosphere can be

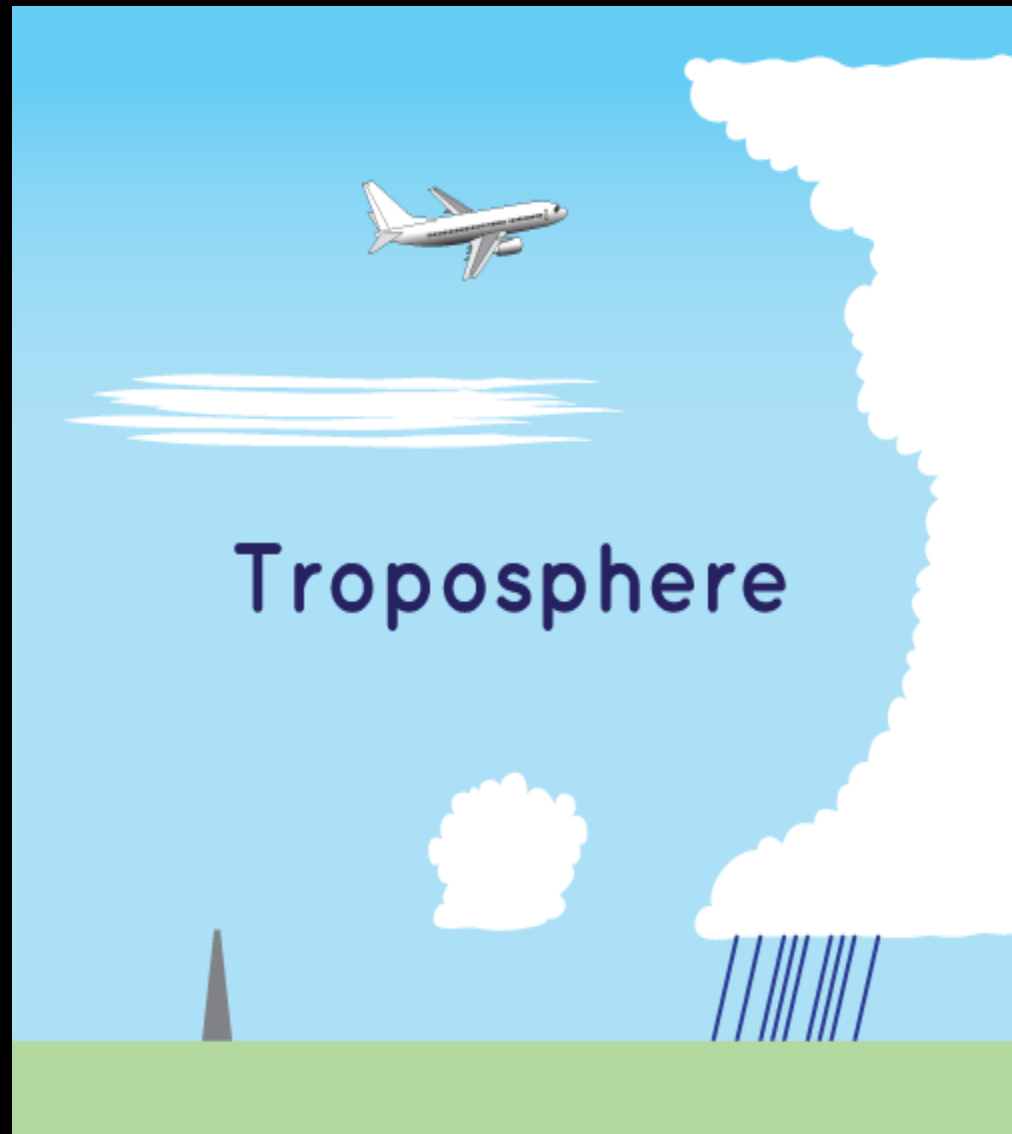
the Earth by

- Troposphere
- Stratosphere
- Mesosphere
- Thermosphere
- Exosphere



TROPOSPHERE

- We live in the troposphere, the layer closest to the ground.
- It is about 10 km in height and contains 75% of the atmospheric gases.
- I extends from 6 to 8 km at the poles and 17 km in equators
- Weather occurs here because this layer contains most of the water vapor.
- Clouds are formed and carried by winds in this layer
- Seasonal variation is very common here

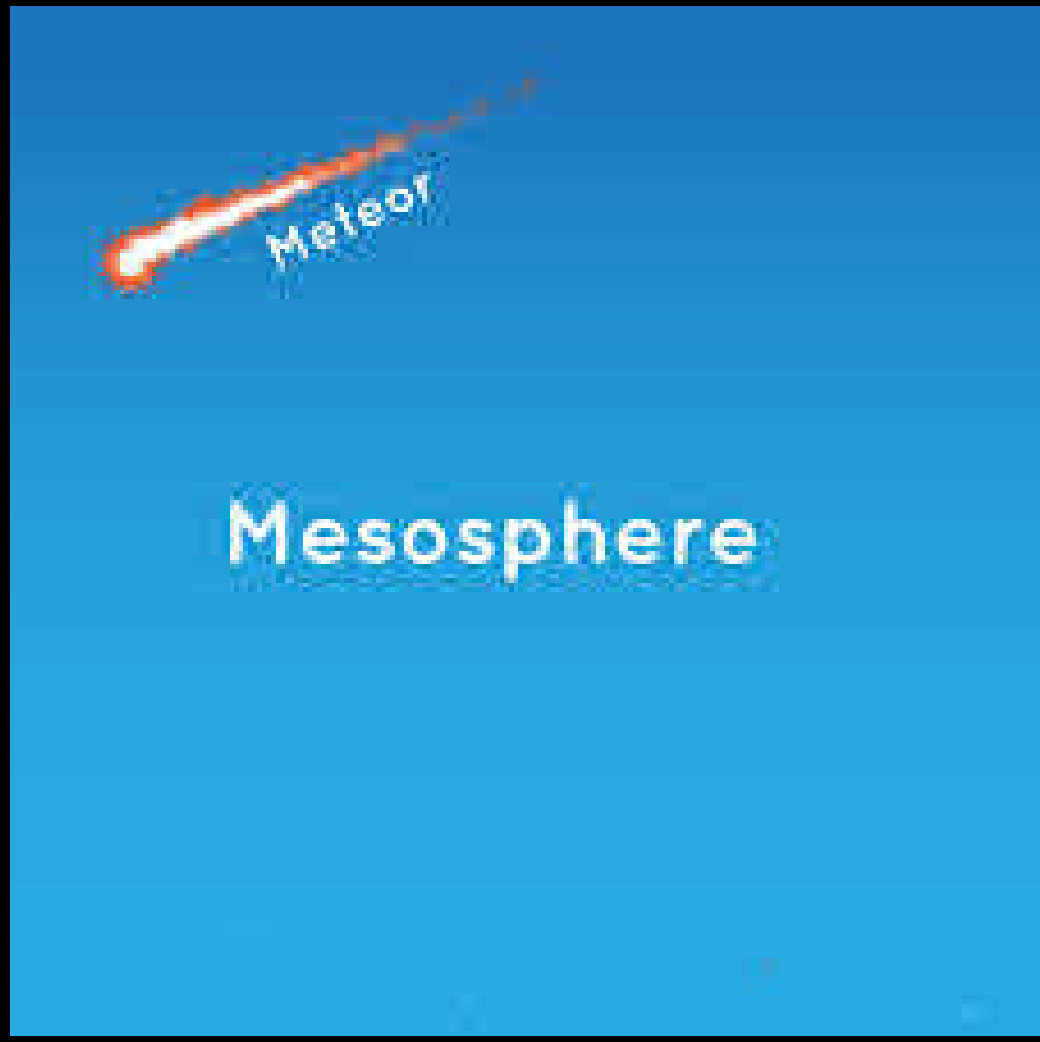


STRATOSPHERE

- Above the troposphere lies the stratosphere.
- The stratosphere extends to the height of 50 km.
- There is no cloud here and the air is still.
- Therefore most planes fly in this layer of the air.
- Here the air is much thinner.
- The top of this layer contains ozone
- This ozone layers absorbs the harmful ultraviolet rays from the Sun.
- These rays cause sunburn and skin cancer.

MESOSPHERE

- Beyond the stratosphere, the air here is very cold and thin.
- The mesosphere is the third layer of the atmosphere, directly above the stratosphere and directly below the thermosphere. In the mesosphere, temperature decreases as altitude increases.
- This layer is known as the mesosphere
- it extends to a height of 80 km.
- It is characterized by the decrease in temperature
- most of the meteorites are being slowed down and burnt out in this layer.



THERMOSPHERE

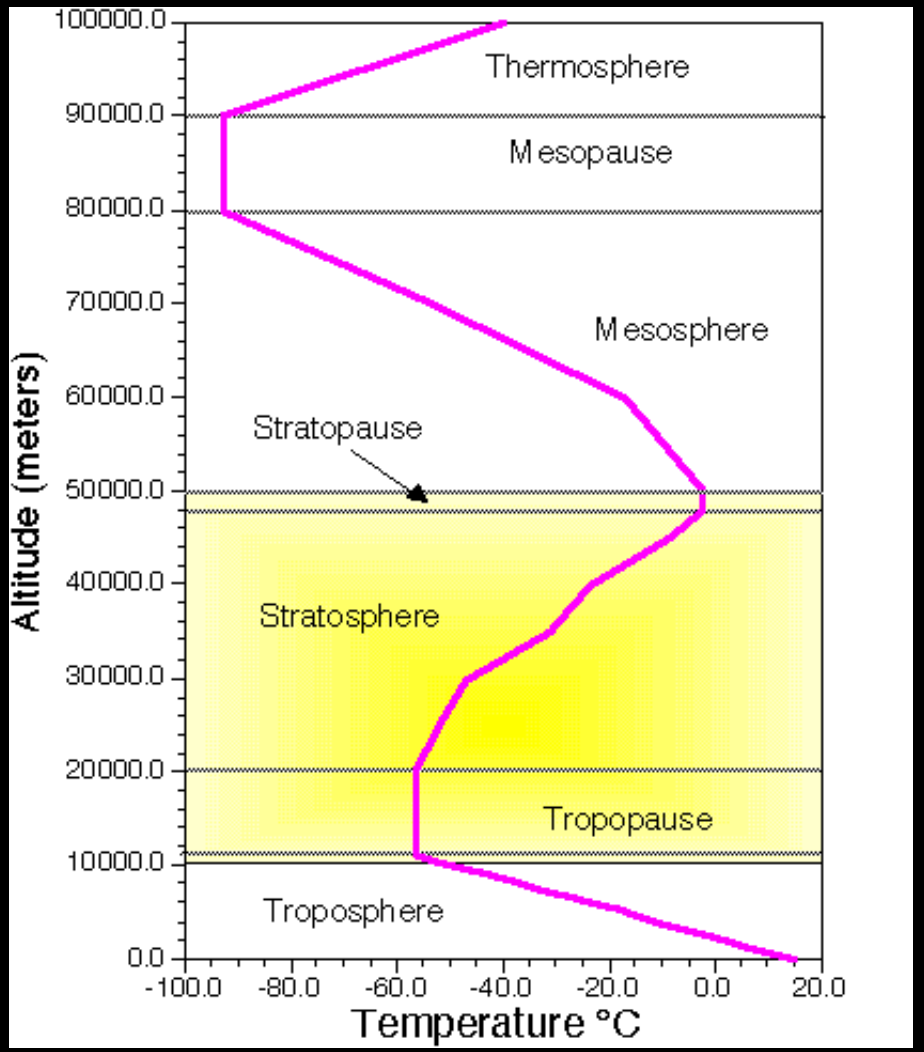
- The thermosphere is the fourth layer from the ground.
- The thermosphere is the layer in the Earth's atmosphere directly above the mesosphere and below the exosphere.
- Within this layer of the atmosphere, ultraviolet radiation causes photoionization/photodissociation of molecules, creating ions; the thermosphere thus constitutes the larger part of the ionosphere.
- It is found between 80 km and 700 km above the Earth.
- Space shuttles fly in this area.
- Aurora lights are found here.

EXOSPHERE

- The furthest layer of the Earth is the exosphere, where the atmosphere merges into the space. Satellites are stationed here.

TEMPERATURE

- The temperature of the atmosphere varies, depending the height from the Earth. It rises and falls throughout the layers of the atmosphere.



USES OF ENVIRONMENT

- Provides the necessary gases for living things to survive
- Regulates the heat from the sun to just the right temperature for life on Earth
- Plays an important role in the water cycle
- The ozone layer protects the Earth from the sun's harmful UV rays
- Protects the Earth from small meteor
- It supplies carbon dioxide for photosynthesis
- It supplies energy resources such as coal, petrol, diesel etc

THANK YOU

SPECIES INTERACTION

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Contents

1. INTRODUCTION
2. Types of Species Interaction:

   a)Competition b)Predation c)Parasitism d)Commensalism e)Mutualism f)Amensalism
3) Coevolution and Species Interaction
4) Conclusion
5) References

Introduction

- Species interaction refers to direct and indirect interrelationship or association between different organisms, which could be between:-

a. plants and plants,
b. plants and animals and
c. animals and animals as well as micro organisms like bacteria, fungi and the like.

Types of Species Interaction

- Competition (- , -)
  - interspecific
  - intraspecific
- Predation (+ , -)
  - carnivory
  - herbivory
- Parasitism (+ , -)
- Commensalism (+ , 0)
- Mutualism (+ , +)
- Amensalism (- , 0)

Symbiosis:Close association or relationship between two or more living organisms, where at least one receives some sort of benefit from the relationship.

The symbols +, - and 0 refer to the effect of one species on another when both are living together.

Competition(–,–)

Competition

- **May be:**
  interspecific, or intraspecific
- **Due to:**
  exploitation, or interference
- **Result in:**
  Competitive exclusion,
  Coexistence by niche separation,
  Character displacement,
  Resource Partitioning.

Interspecific vs. Intraspecific Competition

- When competition is between individuals of:
  - ---- same species (***intraspecific***)
  - ---- different species (***interspecific***)

Exploitation and Interference

- EXPLOITATION-ONE SPECIES DENIES ANOTHER ACCESS TO A RESOURCE SIMPLY BY CONSUMING IT

The older, taller trees create a canopy effectively absorbing the available light. Thus, the younger, smaller trees do not have access to that resource and are less likely to survive.

- Interference-one species actively inhibits the foraging, survival, or reproduction of the other species I.e., chemical, behavioral

Male-male competition in red deer during rut is an example of interference competition within a species.

Results of Competition

- STRONG COMPETITION CAN LEAD TO ***COMPETITIVE EXCLUSION***, LOCAL ELIMINATION OF A COMPETING SPECIES.

- ***COEXISTENCE*** OF A SINGLE SPECIES OR DIFFERENT SPECIES WITHIN A HABITAT BUT IN DIFFERENT NICHES.

•The common spiny mouse and the golden spiny mouse show temporal partitioning of their niches.
•Both species are normally nocturnal (active during the night)
•Where they coexist, the golden spiny mouse becomes diurnal (active during the day)

Results of Competition

- **RESOURCE PARTITIONING AND CHARACTER DISPLACEMENT** – DIVISION OF THE RESOURCES DUE TO RESOURCE PARTIONING AND FURTHER FROM RESOURCE PARTITIONING CHARACTER DISPLACEMENT OCCURS WHICH HELPS IN OBTAINING THAT RESOURCE MORE EFFICIENTLY.

Predation(+,–)

- Predation is when one organism of 1 species **(predator)** consumes part or all of another organism of another species **(prey)**.
- Can be: **herbivores** (plant-eaters) or **carnivores** (meat-eaters).
- This is a **win-lose relationship** (predator wins, prey loses).

HERBIVORY

CARNIVORY

Parasitism(+,–)

- In parasitism (+/– interaction), one organism, the parasite, derives nourishment from another organism, its host, which is harmed in the process.
- Parasites live on or in their hosts; often for long periods of time
- Parasitism has
  - •Negative effect on hosts
  - •But do not usually kill hosts
- Consists of a wide range of organisms, including
  - •Virus, bacteria, protists, fungi, plants, and invertebrates (include arthropods)
  - • 50% of the species on Earth (typically feed on only one or a few host species).

Kinds of Parasitism

- Based on parasites interaction with the host and life cycle:-

1) **Obligate parasites-**totally dependent on the host to complete its life cycle
2) **Facultative parasite-** not completely dependent.

- Based on place of presence of parasite:-

1) **Ectoparasites-** Parasites that live on the surface of the host(e.g. some mites).
2) **Endoparasite-** live inside the host(e.g. all parasitic worms).

Examples of Parasitism

This parasite, called an "***eye worm***" comes from the bite of a deer fly. This eye worm can be crawling under one's skin for years unbeknownst to them unless it reaches the eye. There, it will feel odd, and there will be a visible worm just beneath the eye surface.
Usually found in India and Africa, the eye worm can cause itching, joint pain, and sometimes can be fatal.

Dodder Plant

Although this plant looks innocent enough, it is a parasite and lives off other plants. And, it doesn't wait around either. This vine can sniff out its hosts and hunt them down. It can grow at a rapid pace and spread at an unbelievable rate, and is very hearty thanks to tough seeds. It can destroy crops if not caught early.

Commensalism (+ 0)

- TWO ORGANISMS IN WHICH ONE BENEFITS AND THE OTHER DERIVES NEITHER BENEFIT NOR HARM.
- SPECIES INVOLVED LIVE TOGETHER WITHOUT ENTERING INTO ANY KIND OF PHYSIOLOGICAL EXCHANGE.

Cattle egrets are often found around grazing herbivores, such as these African buffalo or cattle in Texas fields.

Commensalism

Epiphyte

- An epiphyte is a plant that grows upon another plant. Growing on another plant gives the epiphyte better access to sunlight and moisture.
- They have specialized roots to absorb moisture and nutrients from humid air to prepare food so, they are not dependent on the supporting species.
- E.g. : Orchid species

Mutualism(+,+)

- Mutualistic symbiosis, or mutualism (+/+ interaction), is an interaction that benefits both species.
- Mutualism may be obligate (necessary for survival of one or both species) or facultative (one species may survive in the absence of other).
- The basis for agricultural domestication of plants and animals by humans.

Examples of Mutualism

- The lichen is a mutualistic association between a species of **algae** and a species of **fungus**. Algal partner is known as phycobiont and fungal partner is known as mycobiont
- The fungus retains water and takes up minerals.
- The algae provides carbohydrates and other organic nutrients as the result of photosynthesis.

Examples of Mutualism

- One of the most commonly observed mutualism is the pollination of flowering plants by an insect or humming bird.
- The pollinator benefits from the interaction by receiving nectar.
- The plant gets its pollen transferred from one plant to another.

Amensalism(–,0)

- Amensalism is the type of relationship that exists where one species is inhibited or completely obliterated and one is unaffected.
- E.g. **Allelopathy** is a biological phenomenon by which an organism produces one or more biochemical's that influence the growth, survival, and reproduction of other organisms.
- In allelopathy, due to biochemicals produced by one organisms, the other organism may not be able to survive.

Ammensalism

- Black walnut is a prime example of this.
- In addition to its leaves, black walnut trees store allelopathic properties within their buds, nut hulls, and roots.
- The chemical responsible for its toxicity, called **Juglone**, remains in the soil around the tree.
- Plants most susceptible to the black walnut's toxicity include nightshade plants (tomatoes, peppers, eggplants, potatoes), azaleas, pines, and birch trees.

Coevolution And Species Interactions

- All type of interactions have the potential to influence the population densities as well as the gene frequencies of the interacting species.By which, only the superior ones or the one having somekind of mutation or adaptation will survive, which passes its characters to the progenies and the inferior ones gets diminished.

- Coevolution occurs when two species evolve in response to one another.

- Predators evolve in response to prey defenses. Prey evolve in response to predation. E.g. Mimicry, chemical defences etc.

- Mutualists and parasites coevolve with their hosts.

Coevolution and Species Interaction

- Pollinators coevolve with the flowering plants they pollinate.
- E.g. Yucca moths and yucca plantsYucca flowers are a certain shape so only that tiny moth can pollinate them. The moths lay their eggs in the yucca flowers and the larvae (caterpillars) live in the developing ovary and eat yucca seeds.

Conclusion

- The species interactions ranges from mutualism to competition among individuals of the same and among other species is instrumental in explaining the concepts of natural balance in an ecosystem.
- In a nut shell no species that can survive /exist in its own without a minimum degree of interaction within itself or with other species.
- This implies that the species interactions helps to clarify and justify the issues of interrelationships, association and interdependence among species in the ecosystem. It is capitalized here that species interactions is key to the natural balance in the ecosystem.

Thank you

BIOGEOGRAPHICAL CLASSIFICATION OF INDIA

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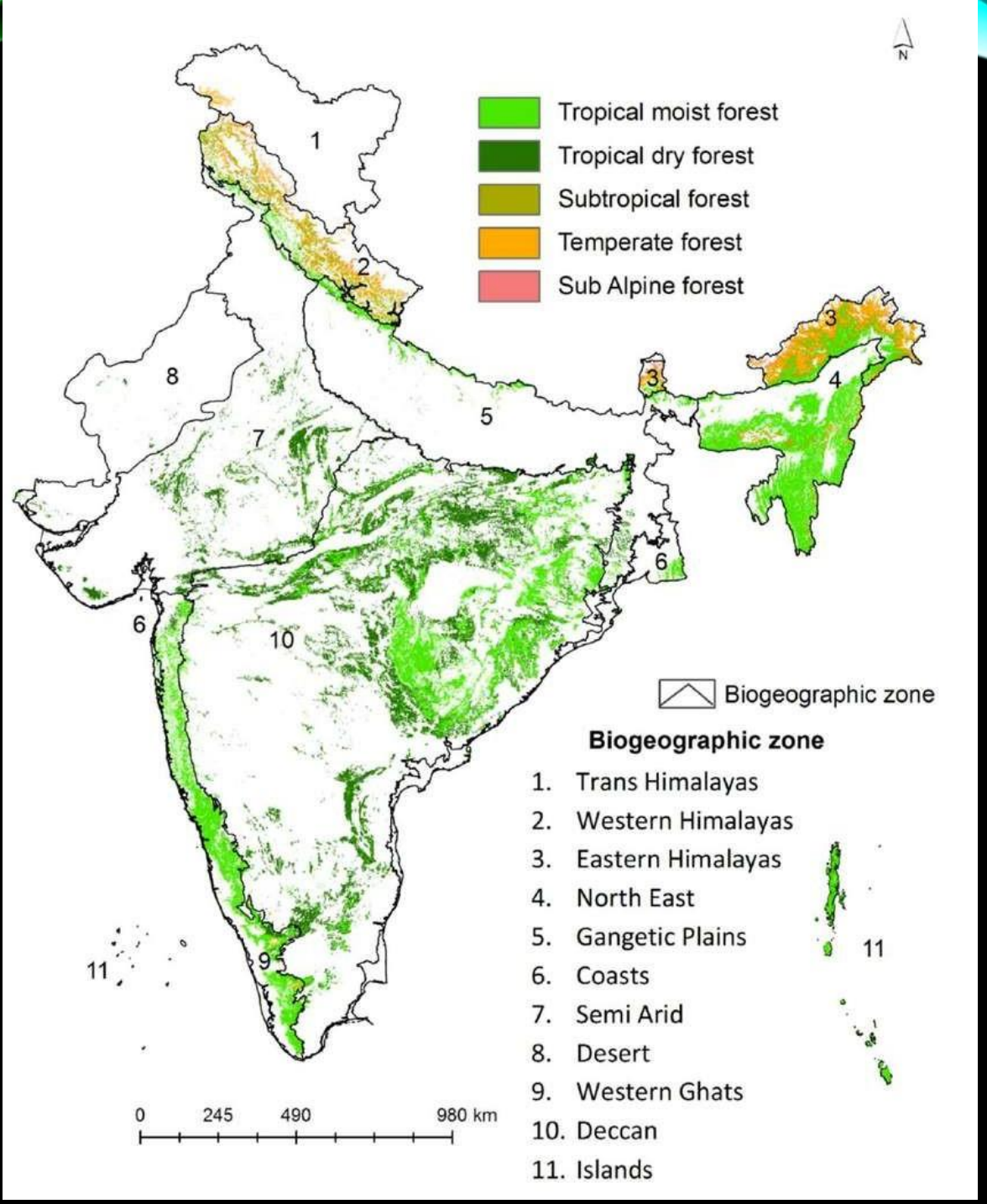
OVERVIEW

- Trans Himalayan zone.
- Himalayan zone
- Desert zone.
- Semiarid zone.
- Western ghat zone.
- Deccan plateau zone.
- Gangetic plain zone.
- North east zone.
- Coastal zone.
- Islands present near the shore line.



Biogeographic zones in India

- Trans Himalayan zone.
- Himalayan zone
- Desert zone.
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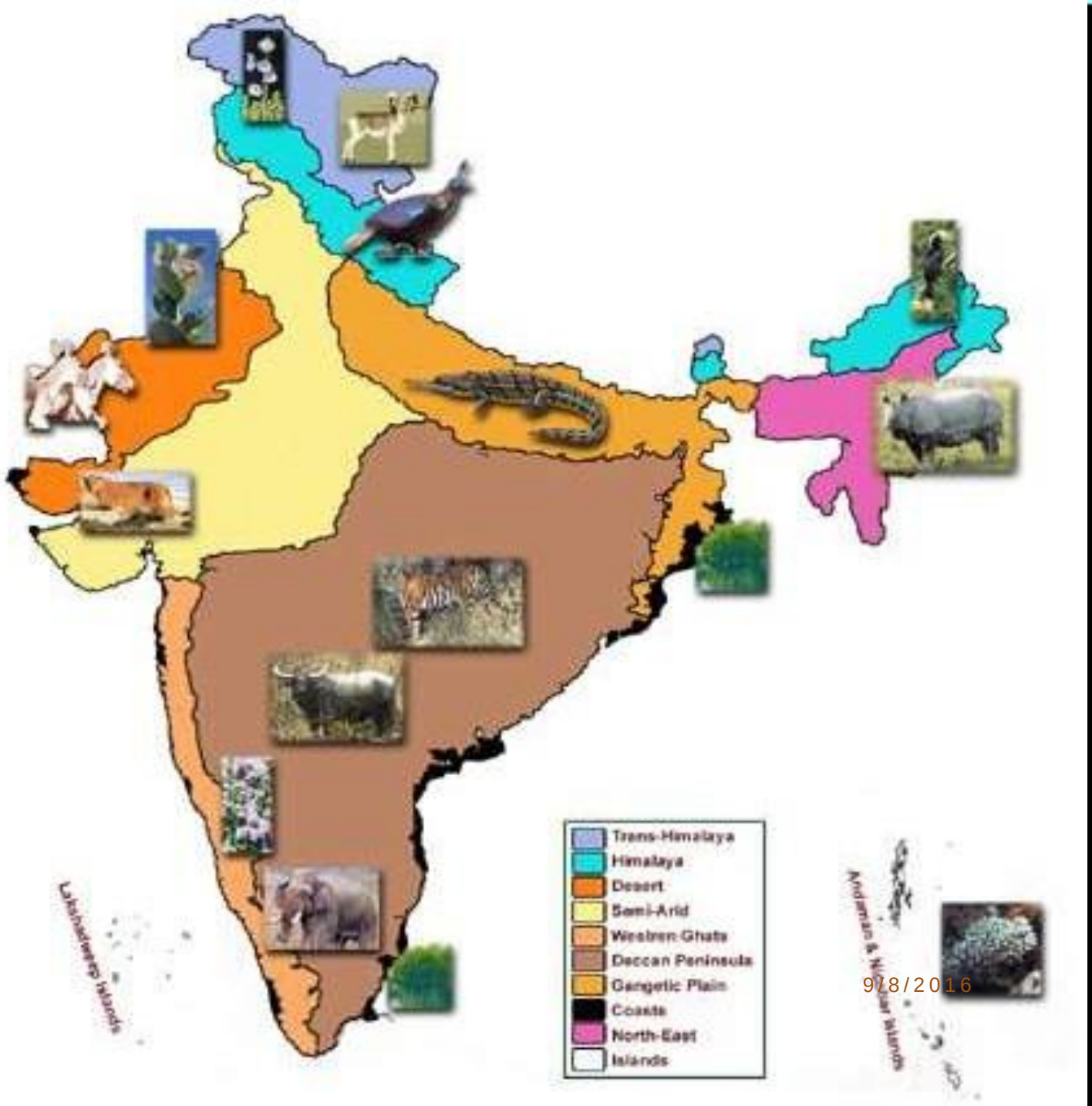

Trans-Himalaya
Himalaya
Desert
Semi-Arid
Western Ghats
Deccan Peninsula
Gangetic Plain
Coasts
North-East
Islands
Lakshadweep Islands
Andaman & Nicobar Islands

Trans-Himalayan region

FEATURES OF TRANS HIMALAYAS

- **COLD AND ARID REGION.**
- **TEMPERATURE -35 to 3 degrees Celsius**
- **4500 mts. Above mean sea level**
- sparse vegetation has the richest wild sheep and goat community in the world
- **Extensive area covered by BARE ROCKS and GLACIERS**
- **FAUNA:-**
  - **wild sheep, wild goats, ibex, snow leopard, marbled cats, marmots, black necked crane**

MARCO POLO SHEEP - RATIO OF HORN LENGTH TO BODY WEIGHT EXCEEDS THAT OF ANY ANIMAL IN THE WORLD

HIMALAYAS

- **FEATURES:-**
  - **Flora: 2,50,000 species**
  - **Fauna: 45,000 species**
  - **Tropical Rainforests- Eastern Himalaya**
  - **Thick subtropical and Alpine forests – central Himalaya, western Himalaya**
  - **Rich endemic forests in north east**
  - **Chief species include** wild sheep, mountain goats, ibex, shrew, and tapir. Panda and snow leopard are also found here.

Classification	No. of species
Angiosperms	15,000
Gymnosperms	64
Pteridophytes	1,022
Bryophytes	2,584
Algae	2,500
Fungi	23,000
Bacteria	850
Lichens	1,600

TOPOGRAPHY OF HIMALAYAS

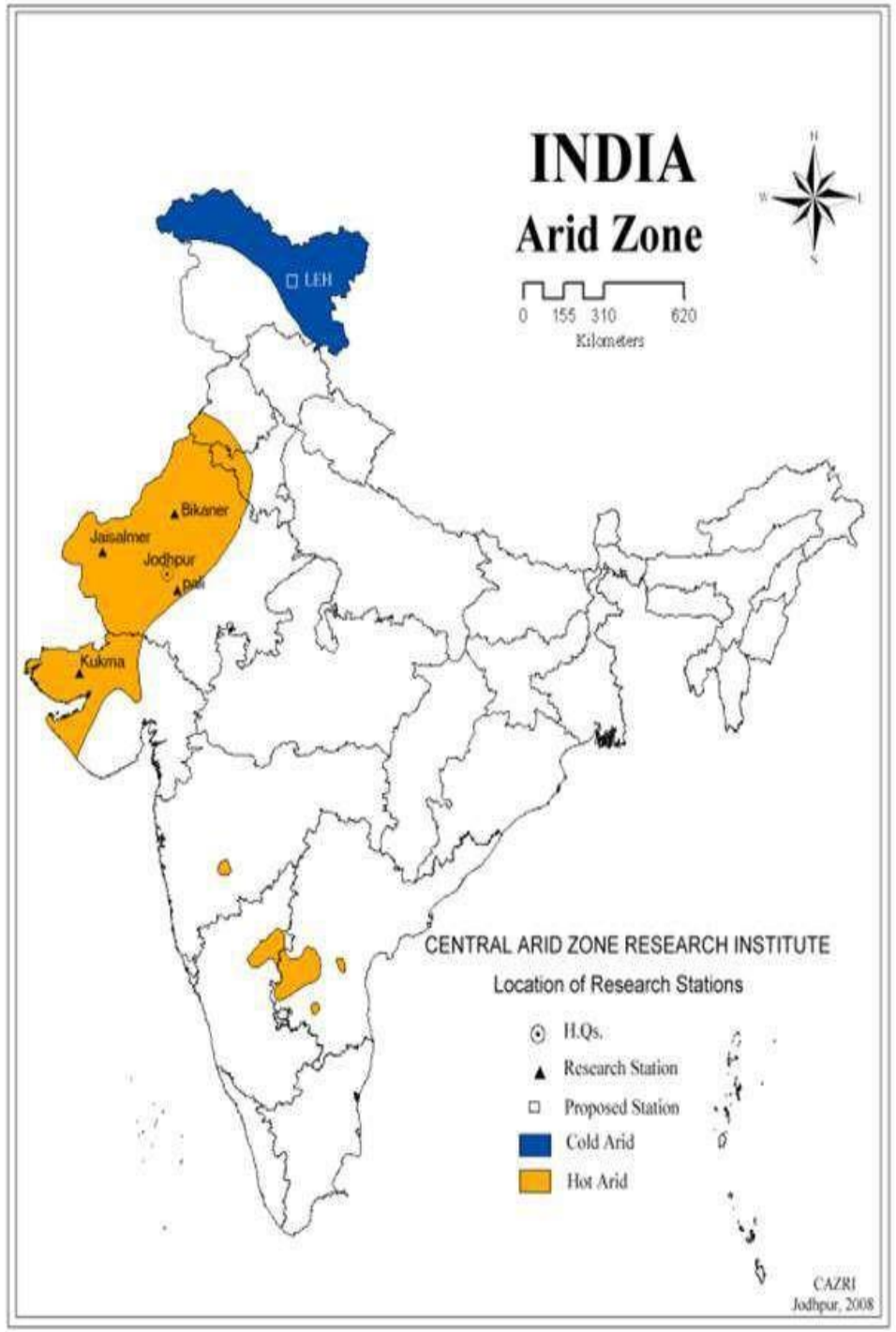
- Young mountains
- Series of mountains running parallel to each other.
- Thick gravel and alluvium
- Source of major snow fed rivers of India.
- Snow covered peaks, glaciers and pristine rivers.

DESERT

1. Deserts in India include Thar desert and Kutch.
2. They receive around 25 cm of precipitation annually.
3. Temperature: 30 to 50 degrees
4. Fauna : Snakes, Owls , mice, armadillo lizards, foxes, bats, vultures, rabbit, cats ,camel etc.
5. Flora: Cactus, prickly pear, octillo plant, boojum.
6. Hot and extreme climate.
7. Vegetation found in oasis.
8. Soil is composed of sand and hard rocks.
9. States covered: Rajasthan and Gujarat

SEMI ARID REGIONS

1. States included: Parts of Punjab, Haryana, Gujarat, Maharashtra.
2. Transitional zone between desert and dense forests of western Ghats.
3. Natural vegetation is thorn forest.
4. Discontinuous vegetation, that is, vegetation in patches.
5. Open areas of bare and water deficit soil.
6. Flora: Thorny shrubs, grasses, cereals, some variety of bamboo, dry forests.
7. Fauna: Birds, jackals, leopards, eagles, snakes, fox, buffalo. Gazelle, lions, wolves, zebras, deer etc.


INDIA
Arid Zone
0 155 310 620
Kilometers
LEH
Bikaner
Jaisalmer
Jodhpur
Barmer
Kukma
CENTRAL ARID ZONE RESEARCH INSTITUTE
Location of Research Stations
H.Qs.
Research Station
Proposed Station
Cold Arid
Hot Arid
CAZRI
Jodhpur, 2008

WESTERN GHATS

- Covers Malabar plains and Western Ghats.
- States included:Tamil Nadu, Maharashtra, Karnataka, Parts of Kerala.
- Mountains along the west coast of India.
- Average altitude of mountains: 900-1500 mts. Above sea level.
- Diverse topography. Unique sets of flora and fauna.
- Rich evergreen forests, medicinal plants, ornamental plants.
- Included in the biodiversity hotspots of the world.

- Sparsely populated. Mainly tribal population lives there.
- Fertile land for rice cultivation, commercial crops, plantation etc.
- 14 endemic species of legless amphibians.
- Fauna: home to 325 globally threatened species, 16 species of endemic mammals, tiger, lion tailed macaque, 288 freshwater species, 508 species of birbs,6000 species of insects, 344 species of butterflies,

DECCAN PLATEAU

- Semi arid regions lying in the rain shadow region of western Ghats.
- Central and eastern highlands provide many forest products.
- Composed of oldest crystalline rocks.
- Height varies from 300 to 900 mts above sea level.
- It is semi arid in the north and tropical in most parts.
- Rain falls in the monsoon and temperature can exceed up to 40 degrees in summer.

- Types of forests: deciduous, thorn forests and scrublands.
- Consists mainly of black soil. Suitable for commercial crops, especially, cotton.
- Flora: teak, Sal.. Consists mainly of dry deciduous forests.
- Fauna: grazing animals, four horned rhinoceros, gaur, wild water buffalo, bear, wild dog, Indian giant squirrel, tiger etc.
- Home to more than ninety species of animals and various other carnivores.


Deccan Plateau

GANGETIC PLAINS

- **Alluvial soil, fertile soil, drained by river ganga.**
- **Purely agro based area.**
- **Major trees in this area: teak, Sal, shisham, mahua, khair etc.**
- **Moist deciduous forests, densest human population.**
- **Fauna: Tiger, one horned rhinoceros, Asian elephant, gaur, swamp deer, crocodile, gharial and a large number of other vertebrae.**
- **States covered: Parts of Haryana, Uttar Pradesh, Bihar, parts of west Bengal.**

- 25-35 cm of annual rainfall.
- Patches of grassland ecosystem.
- 79 known species of mammals.
- Lots of biodiversity conservation areas.
- 95% of the land converted into agricultural land

COASTAL ZONE

- Includes west coast, east coast and Lakshadweep.
- India has coastline extending 5500 kms.
- Best preserved evergreen forests are found here, especially, in Lakshadweep.
- Mangrove forests – a prominent feature.
- Coral reefs are found in Lakshadweep.
- Fertile land is found here. Most suitable for rice and coconut trees.

- **Flora: railroads vines, coconut trees, beach grass etc.**
- **Fauna: large variety of birds, insects and marine animals. Seagulls, pelican, penguin, terns, crabs, sea turtles, seals etc.**
- **States covered: Kerala, Tamil nadu, Karnataka, Andhra Pradesh, Gujarat, goa, Maharashtra, Orissa, west Bengal.**

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NORTH EAST

- One of the richest areas of India in terms of biodiversity.
- Several species of orchids, bamboos, ferns, mango, bananas, citrus fruits, pepper, medicinal plants etc.
- States included: Assam, Arrunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura.
- One of the biodiversity hotspots of the world.
- Fauna: rich in rare species, red panda, slow Loris, marbled cat, leopard cat, bats and rodents, sangai, wild elephant, blue sheep, yak, lots of species of birds, python and other lower vertebrae, amphibians, butterflies etc.

- 51 types of forest ecosystems are found in this area, broadly classified into six categories:
  - tropical moist deciduous forests
  - tropical semi evergreen forests
  - tropical wet evergreen forests
  - subtropical forests
  - temperate forests
  - alpine forests.

ISLANDS

- It includes Andaman and Nicobar islands and Lakshadweep islands.
- Tropical climate, humid weather, no winter season.
- Maximum temperature: 28 degree Celsius.
- Flora: giant evergreen forests, wet bamboo brakes, semi evergreen forests, mangrove forests, sub montane forests.
- Fauna: 50 varieties of forest mammals, wild boar, crocodile, sea cow, leopard, butterflies and moths, shellfish

- over 600 species of marine fishes, 78 species of corals, 82 species of seaweed, 52 species of crabs, 2 species of lobsters, 48 species of gastropods, 12 species of bivalves, 101 species of birds.
- Sparsely populated, tribal population.
- Huge variety of marine species.

Thanks

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