

UNIT: IECOSYSTEMBIODIVERSITY* INTRODUCTION :-

Ecology is the study of eco-system.

Ecosystem is a community of living organisms present in a locale in inter-relation with physical & chemical factors (air, H_2O , soil, climate).

These components are linked with nutrient cycles and energy flow.

Ecosystem \Rightarrow Forest

- \Rightarrow Grasslands
- \Rightarrow Desert.
- \Rightarrow Pond

* COMPONENTSBIOTIC

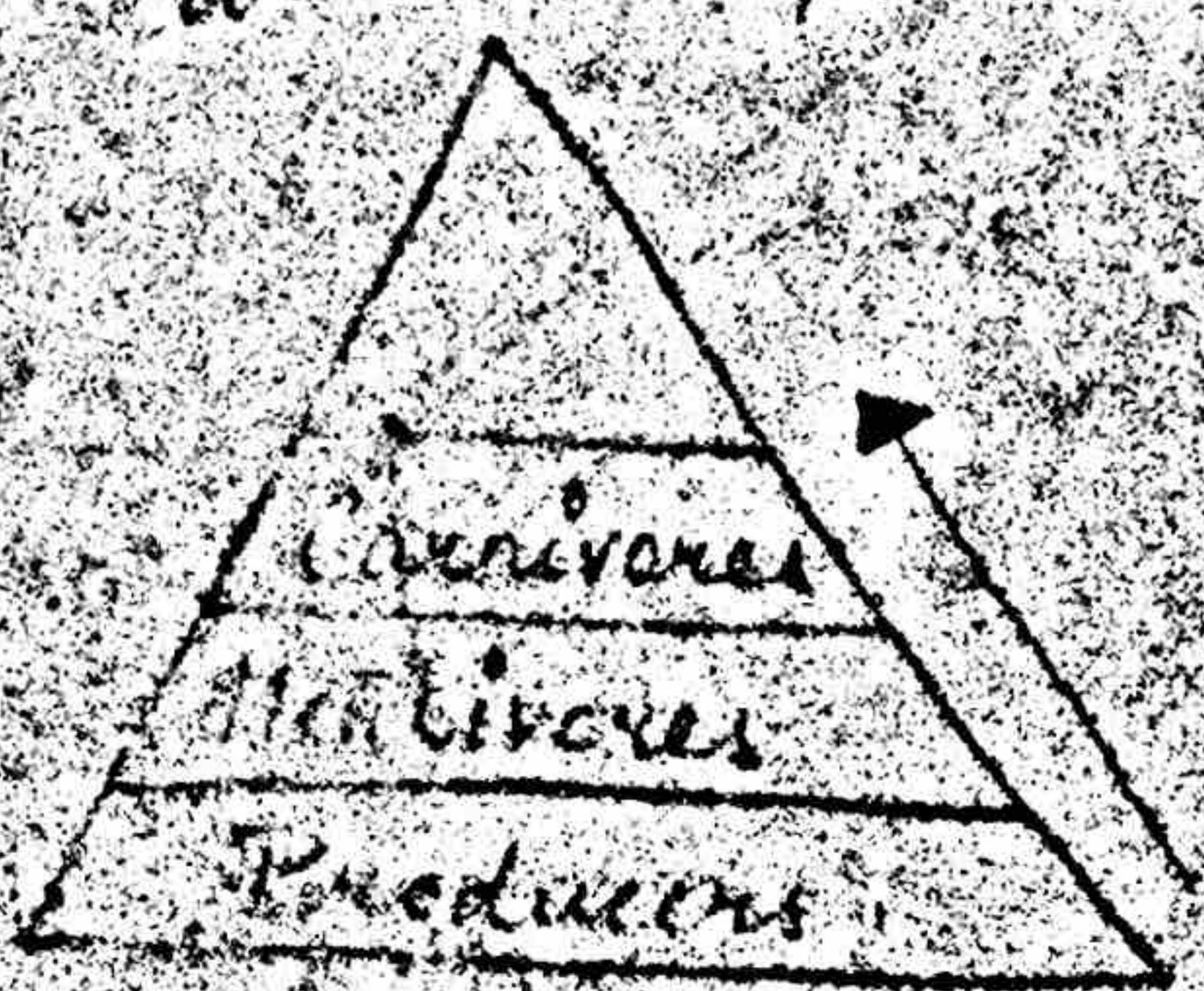
- Primary Producers
- Herbivores
- Carnivores
- Omnivores
- Detritivores

ABIOTIC

- Sunlight
- Temperature
- Water
- Soil chemistry

* STRUCTURE & FUNCTION OF ECOSYSTEM

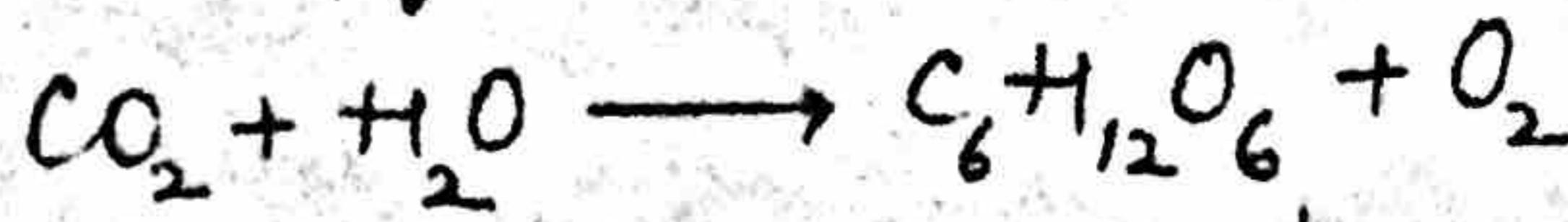
- The main structural feature of any ecosystem is "TROPHIC STRUCTURE" where each animal population is present in different trophic level.



* Functional group is a biological category composed of organisms that perform mostly the same kind of function in the system.

* PRODUCERS :- (AUTOTROPHS)

Producers are the green plants or algae which can synthesize glucose from CO_2 & H_2O in the presence of sunlight.



Producers transform Light Energy into Chemical Energy.

* CONSUMERS :- (HETEROTROPHS)

Consumers obtain energy by eating other organism.

Primary Consumers

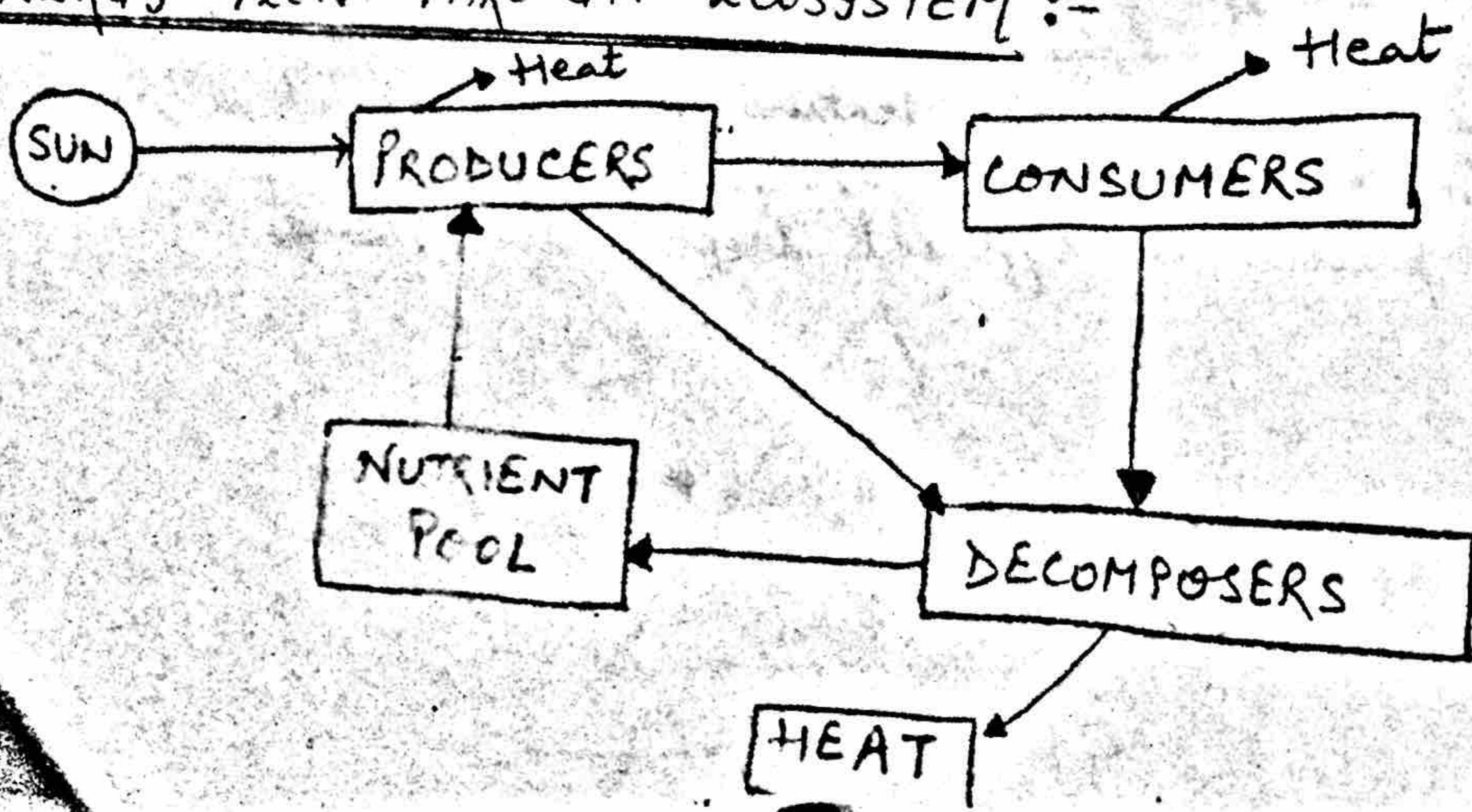
Secondary Consumers

Tertiary Consumers

* DECOMPOSERS :-

These are the final link in a food web breaking down dead organic matter to produce energy which is returned to atmosphere.

* ENERGY FLOW THROUGH ECOSYSTEM :-



sun is the biggest source of energy. In a food chain, energy flows from one organism to another. If any energy remains, it is taken up by decomposers.

- In Ecology, energy flow is also called as "~~NON~~ CALORIFIC FLOW".

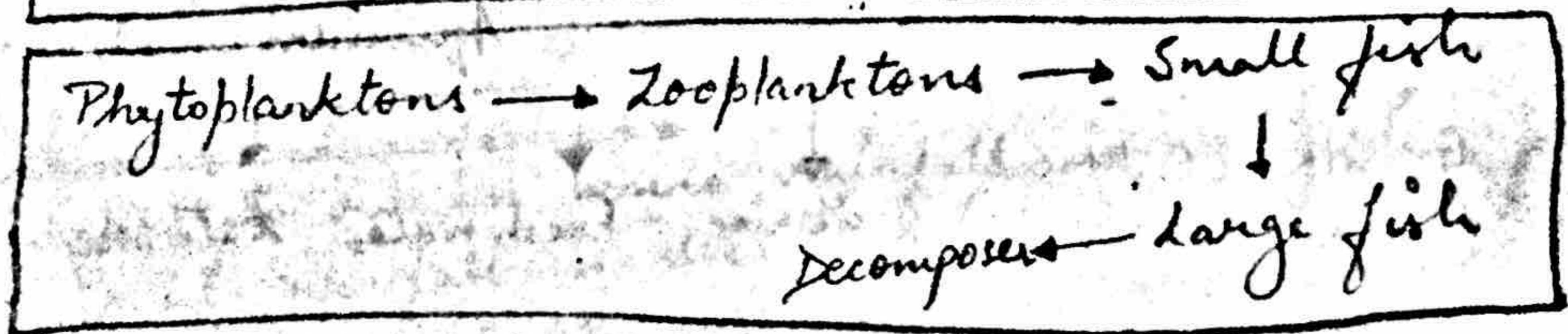
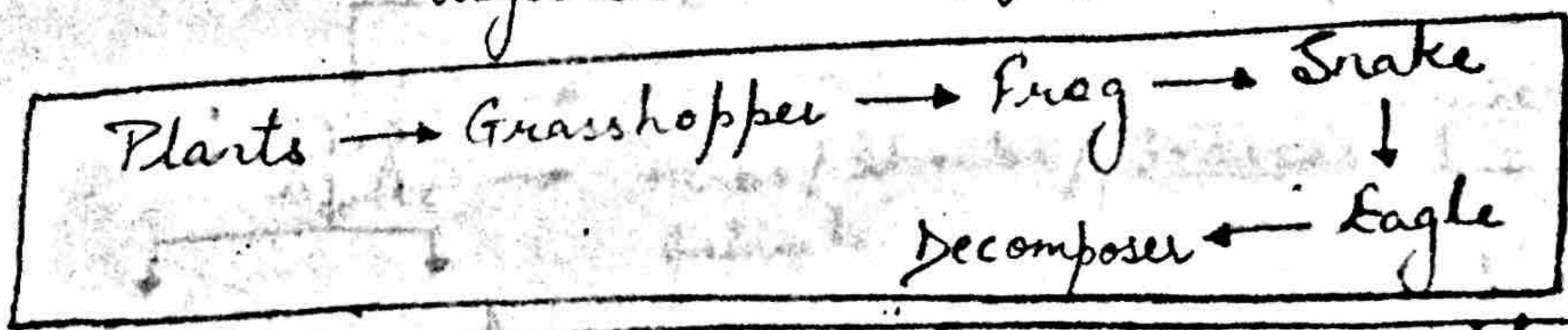
* ECOLOGICAL SUCCESSION →

Ecological Succession is the observed process of change in the species structure of an ecological community over time.

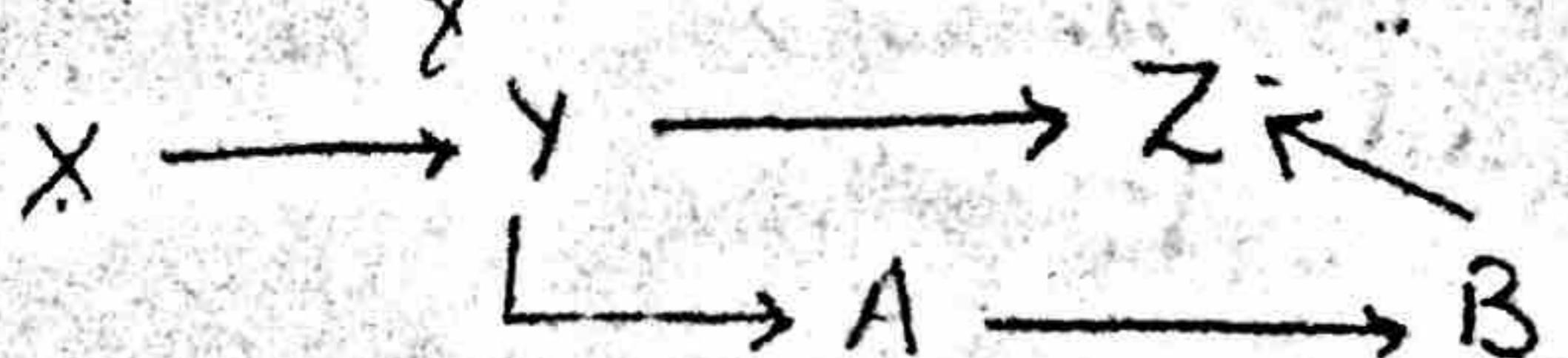
A community begins with relatively few living organisms and becomes complex over a period of time and becomes stable.

* FOOD CHAIN, FOOD WEB, ECOLOGICAL PYRAMIDS →

- a) FOOD CHAIN → A sequence / chain of species linked together consists of food chain.

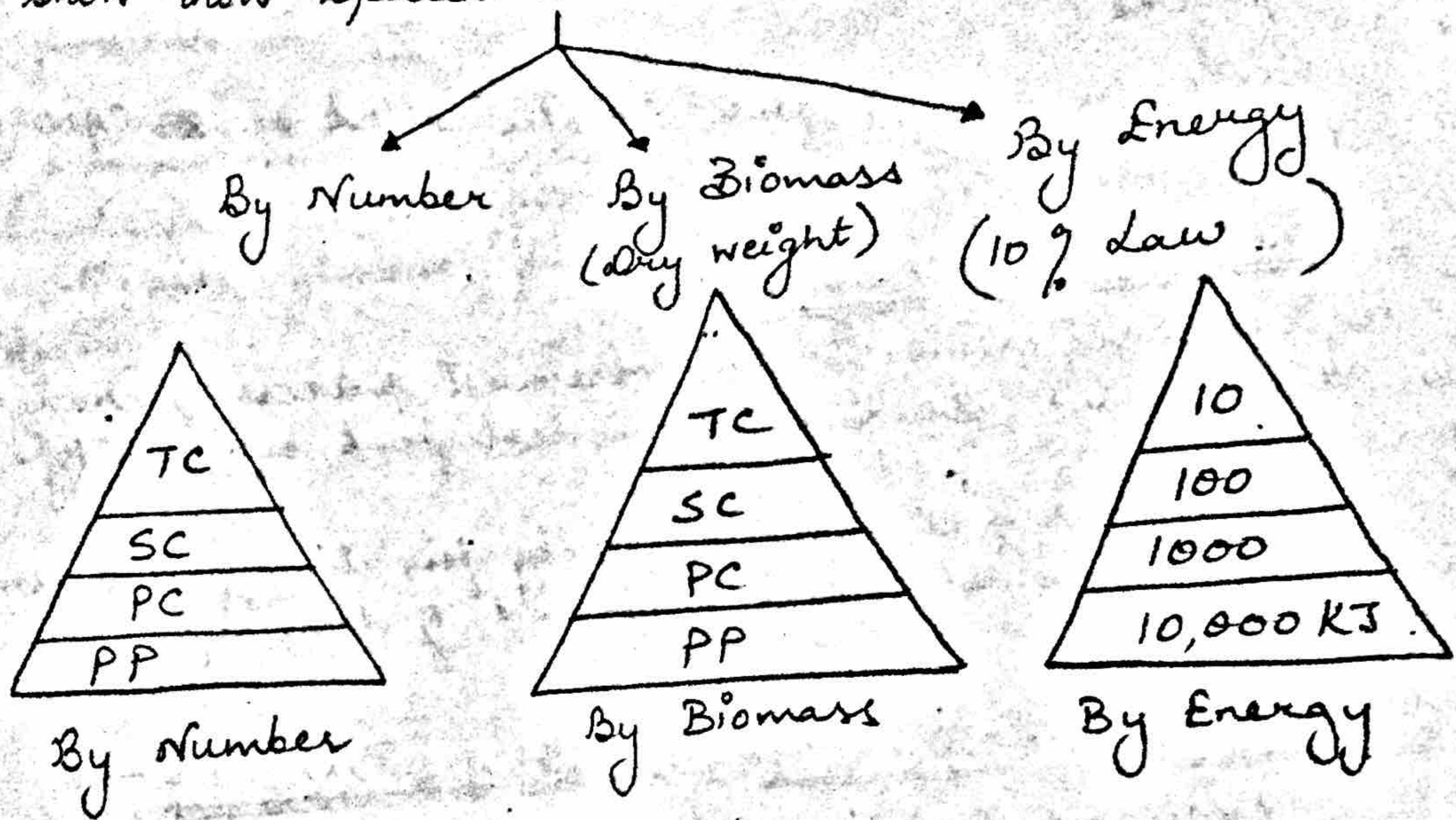


- b) FOOD WEB → A large number of inter-linked chains constitute a web. If any link is broken, it will affect the food chain.

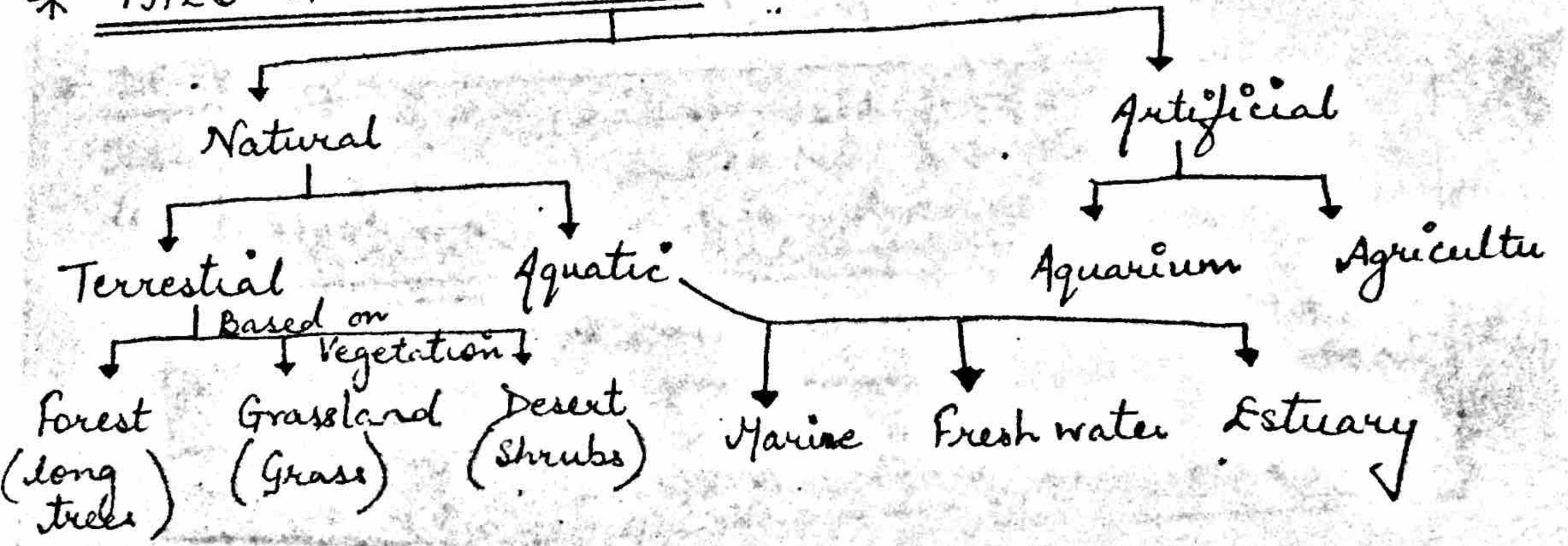


c) ECOLOGICAL PYRAMID :-

It is a graphical representation designed to show how species are inter-linked.



* TYPES OF ECOSYSTEM :-



I FOREST Ecosystem → ③

- A forest is a community of trees, herbs, shrubs and organism that use oxygen, water & soil nutrients.
- Components :-

Abiotic → minerals, inorganic nutrients in soil

Biotic → Producers (Big trees, bush)

Consumers (Animals, Decomposers)

Perfect example of food chain & food web.

II GRASSLAND Ecosystem →

- It is an area where vegetation is dominated by grasses and other non-woody plants.
- About 32% plant covers the world with grass.
- The principal grasslands are :-
 - a) Pampas (South America)
 - b) Prairies (Canada)
 - c) Steppes (Europe / Asia)

Abiotic → inorganic compounds in Soil

Biotic → Herbs / shrubs / Grasses

Animals, Decomposers

III DESERT Ecosystem →

- refers to region where rainfall is negligible, & annual rainfall is less than 250 mm!
- 17% of Earth is Desert.

Abiotic → Nutrients in Soil.

Biotic → Shrubs, Bushes

Insects / Reptiles

Rodents

Thermophilic Bacteria

IV AQUATIC →

a) POND / FRESH WATER:

- O_2 , CO_2 , N_2 , amino acids
- Autotrophic green plants
- Zooplankton
- Decomposers.

b) MARINE:

- Large reservoir.
- has levels (littoral zone → Neritic → Pelagic → Benthic)
- Seaweeds, Phytoplankton
- fishes.

c) ESTUARY:

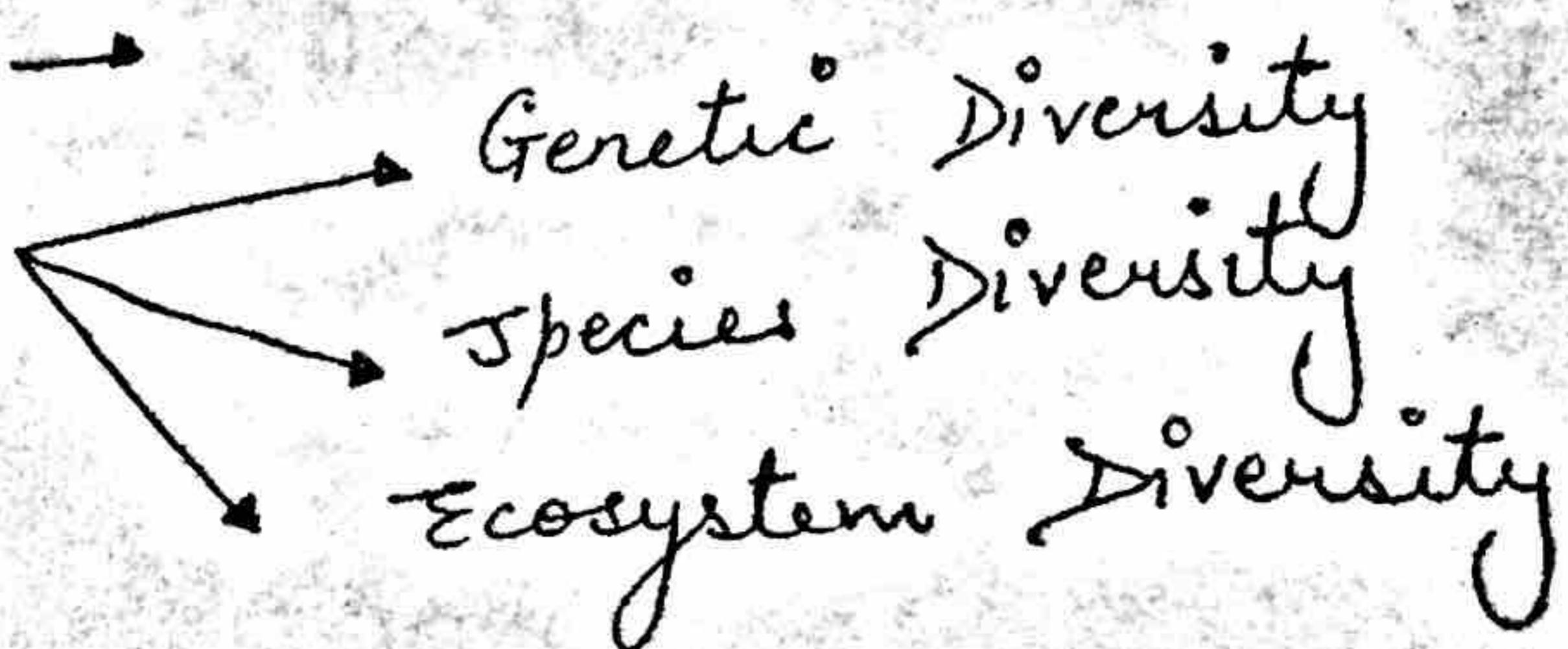
It is a semi-enclosed water body which is connected to both river & open sea.
It has fluctuating characteristics.
Components are of both fresh water & marine water.

TOPIC : BIODIVERSITY

* INTRODUCTION:

Diversity means the number & variety of species.
Biodiversity means the variety of plant & animal life in a particular region.
It represents the quality and characteristic feature of life.

Levels of Biodiversity →
Three levels are there



(a) GENETIC DIVERSITY →

Genes are the basic component of a cell which result in development and physical characteristics.

Variation in such characteristic within same species give rise to genetic diversity.

Genetic diversity can be measured at many different levels like within population, species, community & biome.

(b) SPECIES DIVERSITY →

It is the measure of diversity/variation of species within an ecological community.

Species are relatively easier to identify than genetic diversity.

- Species richness (No. of species per unit area)
- Species evenness (~~No.~~ Evenness of specy)

Specy.	Area I
A	5
B	10
C	15

Area II
20
20
20

specy richness +
specy evenness.

Polar regions has less diversity than Equator region.

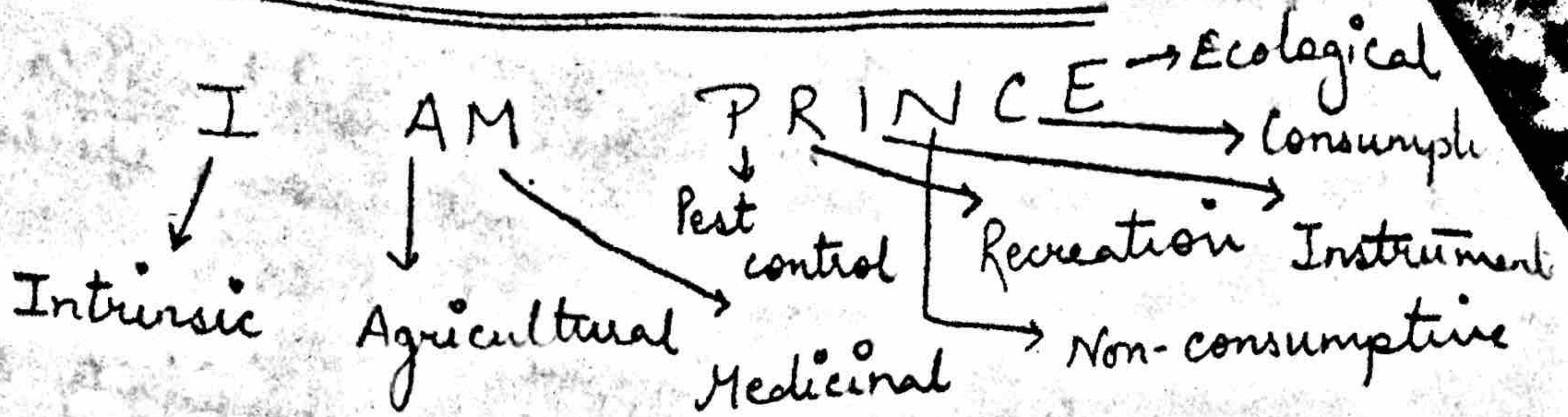
$$\text{Diversity} = \text{Origination} - \text{Extinction} + \text{Immigration}$$

(c) ECOSYSTEM DIVERSITY →

It indicates the variation in the structure and functions of eco-system.

It tells about trophic levels, energy flow and stability.

VALUE / BENEFIT OF BIODIVERSITY →



- a) Intrinsic value :- Every species has their own value within ecosystem.
- b) Agricultural value :- Thousands of plant species can be utilized for many functions.
- c) Medicinal value :- 80% of total population depends on variety of species as medicine.
- d) Pest Control value :- Selected species (Neem) has great value as species.
- e) ~~Instrumental value~~ :-
- f) Recreation value :- People enjoy fishing, camping and other activity.
- g) Instrumental value :- A species or individual organism has instrumental value if its presence benefits other community. Millions of people draw income directly from forest, grasslands etc.
- h) Non-consumptive value :- Soil formation & protection of soil from erosion, carbon fixing.
- i) Consumptive value :- Fruits, Vegetation, Medicine, fibres etc.
- j) Ecological value :- Nutrient cycle, air & H_2O purification, waste disposal & for ecological balance.

* BIOGEOGRAPHIC ZONES OF INDIA →

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a) Trans-Himalayan Zone

(Cold Climate, Vegetation mountain type, Sheep, Goat)
Siachen, Leh, Srinagar

b) Himalayan Zone

(East, West, Central & North West Himalayan Zone)
Elephants, Apes, Lion, Bear
Assam, Arunachal Pradesh and Jammu & Kashmir

c) North-East India

(Moist Climate, Heavy rainfall, Bamboo, Citrus plant)
Cherrapuri, Imphal, Shillong.

d) North-West Desert Zone

(Summer very hot, Winter too cold, less rainfall.
Ground vegetation, bushes) Jodhpur, Jaisalmer

e) Gangetic Plain

(Moderate temperature, moderate rainfall, Ground
vegetation, flowering plants)
Lucknow, Patna, Kolkata

f) Deccan Peninsula Zone

(Average annual rainfall low)
Central India to South India

g) Eastern & Western Sea Coasts

(Moderate Climate, Mangrove ecosystem)
Chennai, Mumbai

h) Western Ghats (Heavy rainfall, forest area)

Pune, Surat

i) Island (Moist Climate, Mangrove, Beach forest)

Ranong, Kavaratti

* HOT SPOTS OF BIODIVERSITY →

The areas on Earth which exhibits high species richness are termed as hot spots.

To qualify :-

- To qualify it:
a) It must support 0.5% global plant species.

There are 34 hot spots of biodiversity.

• In India;

- a) Western Ghats (49,000 plant species)
 - b) Eastern Himalayas

* INDIA as MEGA-DIVERSITY NATION →

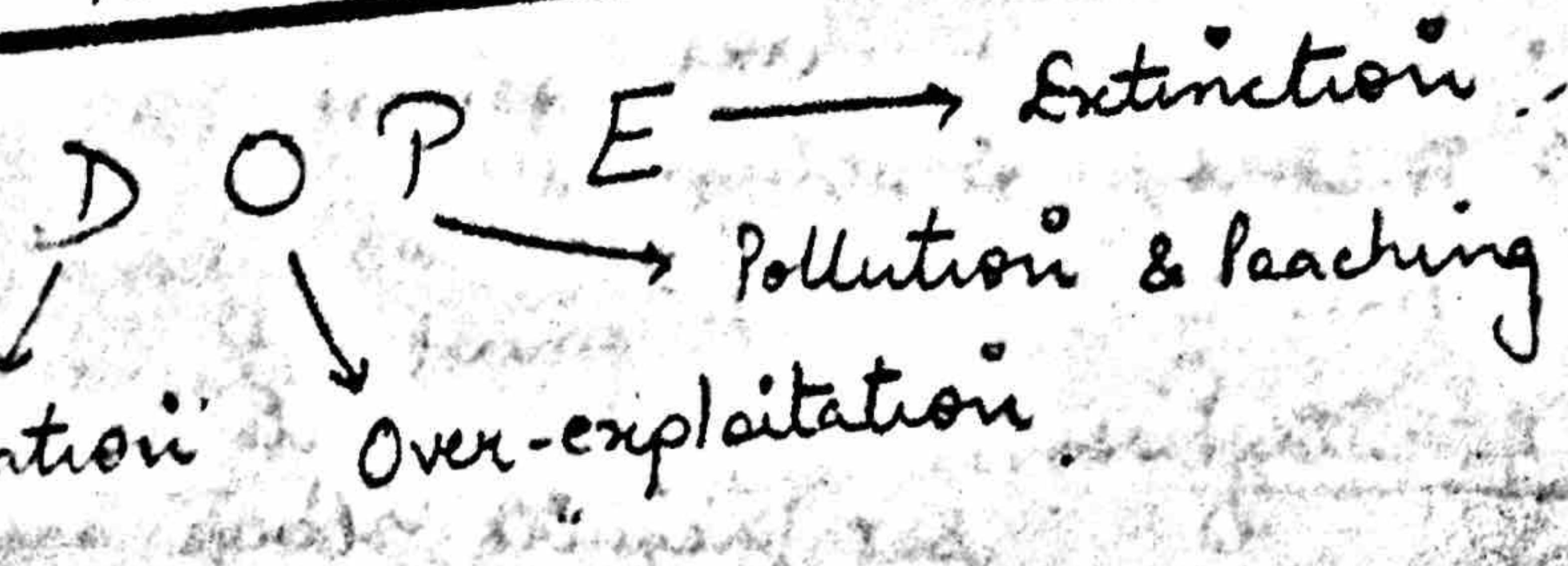
RARE, EXTINCT & THREATENED

6

SPECY →

- a) Fair Specy :- They are less in number but {Endemic & not endangered Specy}.
- b) Threatened Specy :- They are the species which {Vulnerable} will Extinct if not protected. (Rhinoceros, Tiger, Cheetah)
- c) Extinct Specy :- They are not present ^{on} Earth and specy is not recorded. (Dinosaurs, Dodo)

** THREATS TO BIODIVERSITY →



- a) Degradation of Habitat :- Human population is degrading the natural habitat of animals for self-interest.
- b) Over-Exploitation :- Many plant specy are exploited or are under threat due to their Economic values.
- c) Pollution :- Major reason for Climate change and immigration of species.
- d) Extinction :- Extinction of species affects bio-diver
- e) Poaching :- Illegal killing of animals for skin trade.

* CONSERVATION OF BIODIVERSITY →

Aim → Protection, Preservation, Management and Restoration of Natural resources.

Objectives →

- To protect all critically endangered and rare species.
- To protect Natural Habitat
- To maintain ecological balance

Types →

I) IN-SITU CONSERVATION :-

Conservation of Eco-systems and Natural Habitats in natural surroundings.

- Biosphere reserves
- Wild-life Sanctuaries
- National Parks / Zoo

Advantage :- Convenient way to conserve.
but require large area.

II EX-SITU CONSERVATION :-

Conservation outside natural habitat.

- Seed Bank
- Botanical & Zoological Gander

QUESTIONS

(UNIT: I)

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1. Discuss the multi-disciplinary nature of Environmental Science.
2. Explain the concept of Ecosystem with their components.
3. What is Ecological Succession?
4. What do you understand by food Chain & food web? How are they inter-linked?
5. How does the nutrients & Energy flows in an ecosystem?
6. Explain all the types of Ecosystems in detail.
7. What is Bio-diversity? Explain all the levels.
8. Discuss various biogeographic zones of India.
9. What are RET species?
10. How biodiversity can be conserved and what are the threats facing by diversity?
11. Comment on "India as Mega-diversity Nation".