

Bio-Geography :-

Ecology :- (Eco + logy = logy means study)

"Is a science that studies the interdependent, mutually reactive and interconnected relationships between the organisms and their physical environment on the ~~other~~ ^{one} hand, and among the organism on the other hand ^(Savindola Singh) though the term ecology (oekologie or oecologie)

Ecology = German Biologist Ernst Haeckel
in 1869.

Ethology = French Zoologist, Isidore Geoffroy
in 1859.

Hecology = British naturalist St. George Jackson Mivart.

Evolution of Species = Darwin's, 1859

Oecology or Oekology = Ernst Haeckel.

"Associated the subject of ecology to the study of plants and thus defined ecology to be as 'the study of organisms in relation to their environment'."
— E. Warming, 1895, 1905.

Ecology was considered by American ecologist Frederick Clements (1916) as the 'Science of community'.

'Ecology as a scientific natural history' →
Charles Elton.

Emphasised to discover the principles which govern the relationships between plants or animals and their environment.
— British ecologist Macfadyen (1957)

'The science of living beings as members of the whole of nature.'
— K. Friederichs (1958)

'The science of organisms in relation to their total environment, and the inter-relationships of organisms inter-specifically and between them selves.'
— F. Fraser Darling (1963)

Two approaches

(i) Autecology → Ecology relations of individual species in a given ecosystem are studied, and

(ii) Synecology → the study of plant communities in relation to their habitats of a given ecosystem.

'The corresponding range of phenomena, research and problems. That connection ecology has been quite logically extended as well to the field of the interaction of society and its physical environment
— Y. P. Tsvetkov, 1983

Biotic and abiotic components of nature are not only interrelated in reciprocal manner but these two component function in an orderly manner as a definite system.

— E. P. Odum (1963, 1964, 1969, 1971)

ecology as
'the study of the structure and ecosystems'
or 'the study of structure and function of
nature'.

— E. P. Odum

'can make important contribution to their environmen-
tal management!'

— C. C. Park, 1980

'Indeed to many people ecology is almost synonymo-
us with conservation and the environment'

— C. C. Park, 1980

'The whole society of all biota as ecology has
ceased to be a synthesised branch of biology... it
has become a view point'

— K. Friederichs, 1958

Ecology has been viewed as 'a state of the mind'

— J. Maddox (1972)

'On the Basis of the holistic nature, as a unifying social
movement'

— R. F. Dasmann, 1974.

'Highlighted the potential contribution of ecology to
environmental and ecological problems and relevance of
ecological and economic stability and balance'

— N. Simon and P. Heronides
(1970)

Ecology may be divided into four phase —

(I) phase one → Representing the period upto 'first
world war', was dominated by the attempts to
define ecology mainly based on reciprocal relation
between organism and their environment.

(II) phase two → Representing the inter-war period
(between the two world wars), was characteristic
by more rigorous.

(iii) Phase three → From the Second world war to 1960 was characterised by the introduction of system analysis in ecological studies.

(iv) Phase four → It also called modern phase. Since 1960 is characteristic by much diversification and specialization of themes of ecology.

Homeostatis → Homeo means equal and stasis means stabilization.

Homeostatis is balance maintain within the ecosystem.

Cybernetics → This process which was maintain the Homeostatis.

• two process are their → ① Natural

Processes which maintains the ecological equilibrium through natural processes or Anthropogenic processes.

② Anthropogenic

Biome → Total relationship between plant and animal with total area of the earth and area include according climatic phenomena.

Sub-Divisions of Ecology:-

1. Based on Taxonomic Affinities:-

In the beginning, ecology was exclusively associated with biological sciences - botany and zoology and thus plants (botany) and animals (zoology) were studied separately.

This approach led to division of ecology into -

(i) plant ecology and (ii) Animal ecology

2. Sub-division on the Basis of Habitat:-

The Basis of Habitat is that there are variations in habitat in terms of their physical characteristics (topography, soils, insolation and temperature, water, minerals, weather and climatic etc).

A particular habitat on the organisms and general characteristics of biotic communities vary from one habitat to other. This approach of ecological study led to the development of 'habitat ecology'.

3. Sub-division on the Basis of Levels of Organisation:-

Ecology studies is to study either individual organisms or groups of organisms of a particular ecosystem.

Ecology study may be accomplished at two level — (i) study of ecological relationships ~~with in the ecosystem~~ between the species, (ii) ecological relationships with in the ecosystem involving all the organisms present therein.

This approach led to development of (i) Autecology ^(small scale) is the study of relationships of individual species to its environment that autecological approach rests on individual species as fundamental units. (study where various aspects of species like geographical distribution, morphological and taxonomic position, life cycle and succession and ecological factors which affect different stage of growth and development of species.

(ii) Synecology (large scale) → study of complex ecological relationships of groups of organisms known as biological community because organisms (plants, animals, and micro-organisms) affect each other in reciprocal manner and interact with the habitat or natural environment.

Synecology is subdivided into 'Population ecology' (the study of interaction of individuals - population of single species with each other) 'Community ecology' (the study of interrelationships and interdependencies of groups of individuals of different species - plants and animals together) 'Biome ecology' (interactions and interrelationships of more than one biological communities in different stages of Succession) 'Ecosystem ecology' (interactions and interrelationships of all organisms among themselves and with their environment).

→ (Boundary between two ecosystem)

• Ecotone: - Is a transitional area of vegetation between two different plant communities, such as forest and grassland. It has some of the characteristics of each bordering biological community and often contains species not found in the overlapping communities.

Ecocline → Julian Huxley (1938)

An ecocline or cline consist of ecotypes or forms of species that exhibit gradual phenotypic and/or genetic differences over a geographical area, typically as a result of environmental heterogeneity.

The study of ecocline representing the changing conditions across an ecosystem boundaries is known as 'gradient analysis'.

• Division of world ecosystem → M. S. Bradshaw, 1979.

• Deacon four profile diagrams of four ecocline on a major world scale → R. C. Whittaker, 1940

↓
A) From Appalachians to Southern Texas (USA) → Basis of increasing acidity.

B) From equatorial rain-forest to desert area → Basis of increasing acidity.

C) From ground surface to higher altitudes of the Andes → Basis of increasing altitude.

D) From tropical rain-forest to tundra → Basis of decreasing temperature.

• Spatial Scales → Ecosystem are divided into different types of various orders on the basis of spatial dimension required for specific purposes.

The largest ecosystem is the whole biosphere which is subdivided into two major types: (A) continental ecosystem and (B) oceanic or marine ecosystem,

Spatial scale may be brought down from a continent to a single biotic life (plant or animal)

• Flora → flora is the plant life occurring in a particular region, generally the naturally occurring or indigenous - native plant life.

The mixture of organisms regularly found at any anatomical site is referred to as the Normal flora, except by researchers in the field who prefer the term 'Indigenous microbiota'

- 180 day growing period in north Georgia
- 270 day " " in the coastal region
- 33 million acres of forested land.
- Rome's Marshall Forest: only virgin forest within in a city limits in the United States
- known for, giant live oaks, pines, peach trees, pecan trees, dogwoods and cherry blossoms.

• Fauna →

• fauna is all of the animal life of any particular region or time.

• the corresponding term for plants is flora. flora, fauna and other forms of life such as fungi are collectively referred to as biota.

Zoologists and paleontologists use fauna to refer to a typical collection of animals found in a specific time or place the 'Sonoran Desert fauna' or the 'Burgess shale' fauna.

~~the~~ paleontologists sometimes refer to a sequence of faunal stages, which is a series of rocks all containing similar fossils.

• Sub division →

Cryptofauna (the fauna that exist in protected or concealed microhabitats)

Cryofauna (are animals that live in, or very close to, ice)

Benthofauna (are benthic organisms that live within the bottom substratum of a body of water, especially within the bottom-most oceanic surface)

Epifauna (It also called epibenthos, are aquatic animals that live on the bottom substratum as opposed to within, ^{that is,} the benthic fauna that live on top of the sediment surface at the seafloor)

Macrofauna (Benthic or soil organisms which retained on a 0.5 mm sieve. microfauna as animals retained on a 0.3 mm sieve to account for the small size of many of the taxa)

Megafauna (large animals of any particular region or time exam → Australian megafauna).

Meiofauna (small benthic invertebrates that live in both marine and fresh water environments, it larger than microfauna but smaller than macrofauna) rather than a taxonomic grouping)

Microfauna (are microscopic or very small animals usually including protozoans and very small animals such as rotifers)

Meso fauna (are macroscopic soil animals such as arthropods or nematodes. It extremely diverse, approximately 6,500 species had been identified)

Others (term include avifauna, which mean bird fauna, and piscifuna or ichthyofauna, which mean fish fauna)

Habitat → where a particular ^{of} species ~~live~~ life

Every animal has a habitat.

The place where an animal or plant lives and grows is called its habitat.

A habitat is where an animal finds the food, water, and shelter it needs to live.

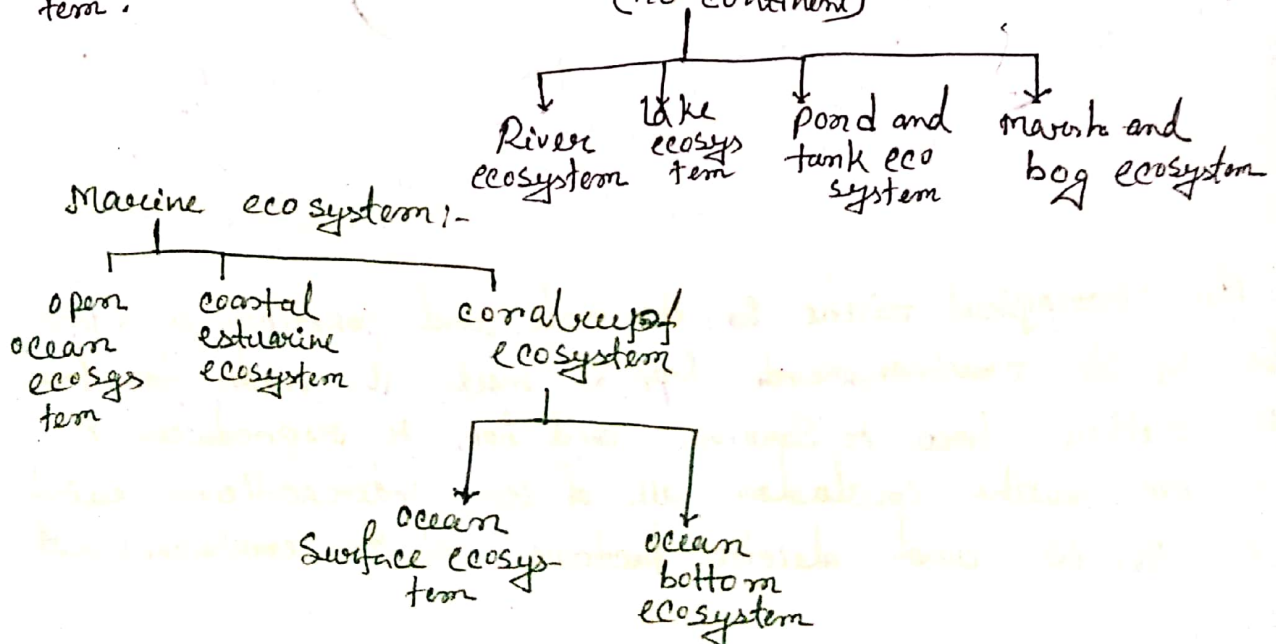
For example, a toucan's habitat is the rainforest.

2) Lions live in a wide range of habitats, from open plains to thick brush and dry thorn forest.

3) Giant pandas live only in a habitat with a cool, moist climate.

• Based on pressure the world ecosystems are divided into two major categories - (A) Terrestrial ecosystem → ~~It is subdivided~~ It further divided into sub categories like (i) upland or mountain ecosystems (ii) Lowland ecosystems (iii) warm desert ecosystem (iv) cold desert "

(B) the aquatic ecosystem → It further divided into sub categories like - (i) freshwater (no continent) (ii) Marine ecosystem.



Ecological niche

working persistently term, as niche, Animal's activity zone where animal was done their work and then they back into the habitat. This is called Ecological niche. It include Habitat. It depend on the Habitat.

The concept of ecological niche was first introduced by J. Grinnel in 1917. It was developed by Charles Elton in the year 1927.

Hutchinson proposed more biophysical definition of ecological niche.

Such ~~common~~ locality having ideal environmental conditions which are suitable for the survival of specific species is called niche.

'The functional role and position (micro habitat) of species in its ecosystem, including what resources it uses, how and when it uses the resources and how it interacts with other species'

— W.P. and M.A. Cunningham, 2003

There are temporal changes in ecological niche as the species develop new way to exploit resources.

An ecological niche is the role and position a species has in its environment, how it meets its needs for food and shelter, how it survives, and how it reproduces. A species niche includes all of its interaction with the biotic and abiotic factors of its environment.

'Law of competitive exclusion works, which states that no two species will occupy the same niche and compete for exactly the same resources in the same habitat for very long!'

— Cunningham and Cunningham, 2003

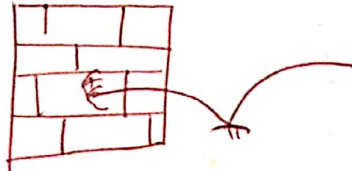
The process of minimization of competition for resources is called 'resource partition', which can allow several species to utilize different parts of the same resource and coexist within a single habitat (niche)

— Cunningham and Cunningham, 2003

Ecosystem resilience & cybernetic

Ecosystem Resilience →

(Resilience is the ability to "bounce back" from set backs, and/or overcome hardships.)



Ecological Resilience, An active learning module about ecosystem change.

System, A group of interacting or interdependent parts.

Maintains its existence and functions as a whole through the interaction of its parts.

"Seedpod" is a static system

Ecosystems are dynamic system, with interactions that change over time.

Resilience, the capability or degree to which an ecosystem can resist perturbation and remain within the ~~from~~ functional boundaries that characterize it without "flipping" to a different set of functional boundaries.

• The amount of change a system can undergo and remain in the same regime, retaining the same structure, function and feedbacks.

Resilience and Ecosystems →

Resilience Systems maintain both properties and processes when disturbed.

A resilient "seedpod" will retain its structure and continue to hold the ball

A resilient forest ecosystem will retain its plant and animal species and processes of nutrient cycling and disturbance.

Resilience, a dynamic property of Systems
Not good or bad - depends on human values

Ability of a System to recover more important than the speed of recovery

opposite of resilience = vulnerability

Alternate states in Ecosystems. Ecosystem can be in different states when they have different species, or even when they have the same species but the systems function differently
Forest →

- Forest, sufficient nutrients to support regeneration.
- cleared, eroded land, insufficient nutrients and soil

Rangeland →

- Grassland system, ~~nutrient~~ nutrients even evenly distributed.
- Shrubland, nutrient islands and barren interspace.

Lake →

- clear water, abundant fish.
- Mucky water, fish die.

States → the states of a system is defined by the values of the states variables that constitute the system.

Threshold →

threshold point at which a system crosses into a new set of stable states.

~~level of disturbance that~~

Thresholds in Ecosystems →

lake; amount of P in sediment

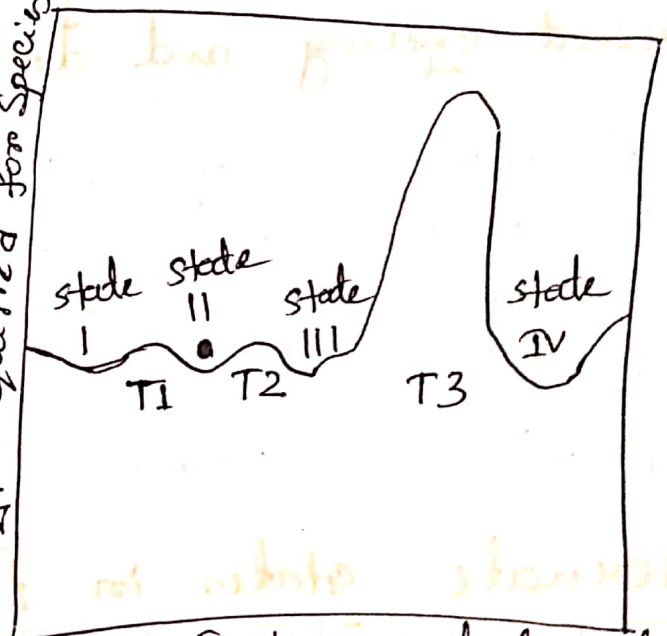
- Australian Rangeland:

amount of grazing pressure, rainfall & fire frequency

- Forest? (Eastern Island)

amount of soil N

Energy Required for Species change



← — Environmental and Managerial change — →

George et al 1992

Equilibrium → In several sciences, is the condition of a system in which all competing influences are balanced, resulting in no net change.