**INTRODUCTION**

**1. Definition:**

The word **"ecology"** was coined in 1866 by the German biologist Ernst Haeckel, derived from two Greek words: **\*oikos\*,** meaning house or habitat, and **\*logos\*,** meaning science. Ecology thus appears as the science of habitat, studying the conditions of existence of living beings and the interactions of all kinds that exist between these living beings and their environments. It aims to understand the mechanisms that allow different species of organisms to survive and coexist by sharing or competing for available resources (space, time, energy, matter). By extension, ecology relies on related sciences such as climatology, hydrology, oceanography, chemistry, geology, pedology, physiology, genetics, ethology, etc. This makes ecology a multidisciplinary science!

**2. Areas of Study** :

Ecological studies conventionally focus on three levels:

The individual, the population, and the community.

**The individual is a specimen of a given species. A biological individual is either an isolated living cell or a group of living cells attached together and originating from the same mother cell... nf:**

**The species: a group of interbreeding individuals that are reproductively isolated from other equivalent groups.**

**The population: is a group of individuals of the same species occupying a particular territory at a given time.**

**The community: is the set of populations living in a given environment.**

**A community or biocoenosis: is the set of communities in the same environment, i.e., the animal community (zoocoenosis) and/or plant community (phytocoenosis) that live under the same environmental conditions and in proximity to each other (e.g., living community of a forest).**

Each of these three levels is the subject of a branch of ecology:

- The individual concerns **autoecology:** this is the science that studies the relationships of a single species with its environment. It defines the tolerance limits and preferences of the studied species with respect to various ecological factors and examines the influence of the environment on morphology, physiology, and ethology.

- The population concerns **population ecology or population dynamics:** this is the science that studies the qualitative and quantitative characteristics of populations: it analyzes variations in the abundance of various species to identify their causes and, if possible, predict them.

- The biocenosis concerns **synecology**: this is the science that analyzes the relationships between individuals belonging to different species within the same community and their interactions with their environment.

**3. Concept of Ecological System: Ecosystem**

An ecological system or ecosystem was defined by the English botanist **Arthur Tansley** in **1935**

**An ecosystem:** is by definition a system, meaning a set of elements interacting with each other. It is a biological system formed by two inseparable elements, the biocenosis and the biotope.

* **The biocenosis**: is the set of organisms living together (zoocenosis, phytocenosis, microbiocenosis, mycocenosis...).
* **The biotope (ecotope):** is the fragment of the biosphere that provides the abiotic environment essential to the biocenosis. It is also defined as the set of abiotic ecological factors (substrate, soil "edaphotope," climate "climatope") that characterize the environment where a specific biocenosis lives.

Biocenosis: phytocenosis (trees, herbaceous plants) and zoocenosis (animals).

Biotope: soil.

The concept of an ecosystem is multiscale, meaning it can be applied to portions of the biosphere of varying sizes; a lake, a meadow, or a dead tree...

Depending on the scale of the ecosystem, we have:

* a micro-ecosystem for example, a tree.
* a meso-ecosystem: for example, a forest.
* a macro-ecosystem: for example, a region.

Ecosystems are often classified by reference to the biotopes concerned. We speak of:

* Continental (or terrestrial) ecosystems such as: forest ecosystems (forests), grassland ecosystems (grasslands), (agricultural systems);
* Continental water ecosystems, for **lentic** ecosystems of calm, slow-renewing waters (lakes, marshes, ponds) or **lotic** ecosystems of flowing waters (rivers, streams)
* Oceanic ecosystems (seas, oceans).