





## Lecture: 1

# An Introduction to Biodiversity

# Biodiversity as a concept

≈ The variety of life

– US Congress Office of Technology Assessment definition:  
*“the variety and variability among living organisms & the ecological complexes in which they occur...”* (OTA, 1987)

– IUCN definition

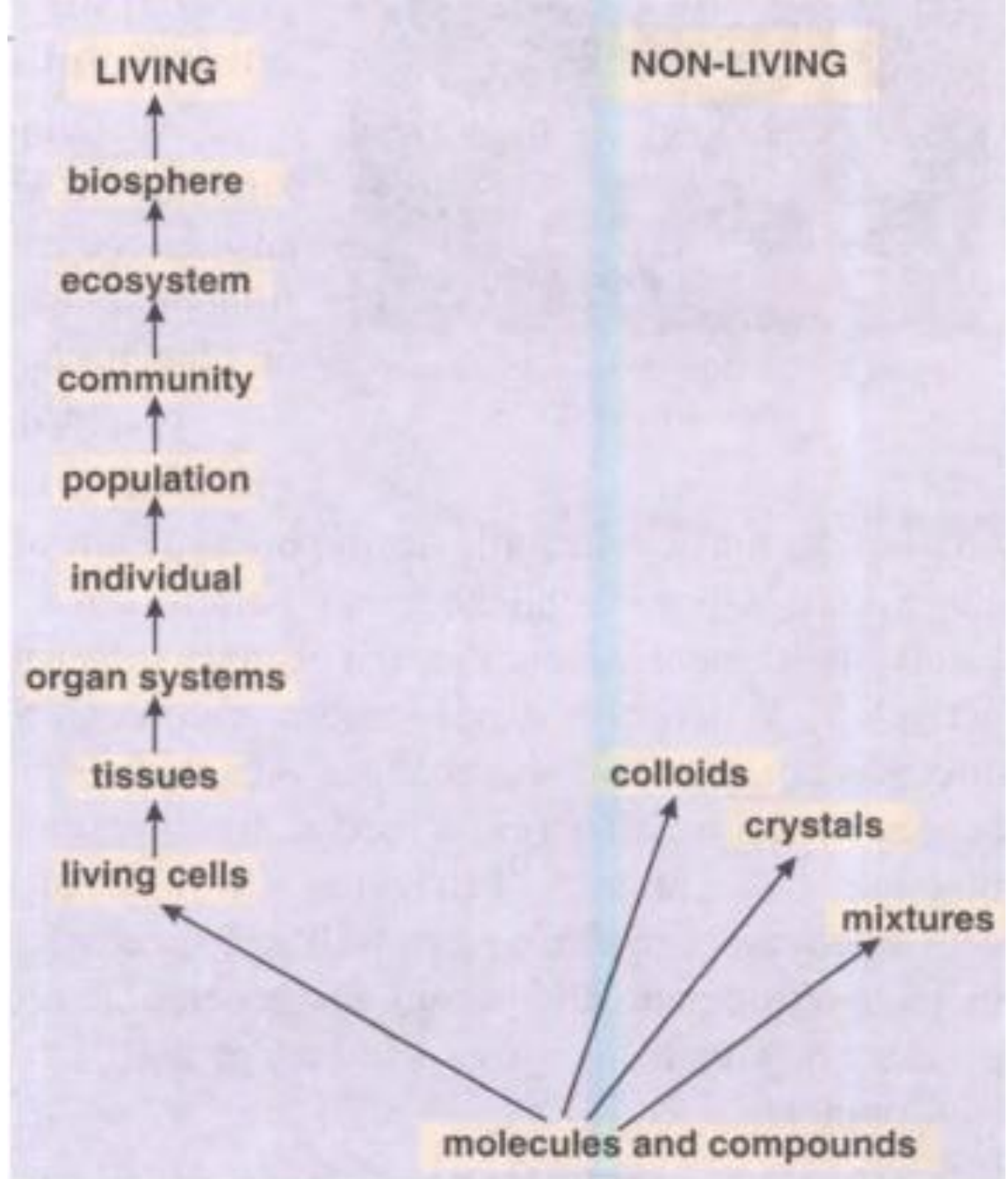
(<http://www.iucn.org/themes/ssc/publications/policy/invasivesEng.htm>) :

*"Biological diversity" (biodiversity) means the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems.*

## 1.1 What is Biodiversity?

Biodiversity comes from the term 'biological diversity'. Biodiversity is a term given to the variety of all forms of life on Earth including plants, animals and micro-organisms and their interrelationship ('**Bio**' means life and **Diversity** means variety). Biodiversity includes a variety of ***ecosystems, species*** and ***genes***, and the ecological processes that support them (Figure 1).

Levels of organization





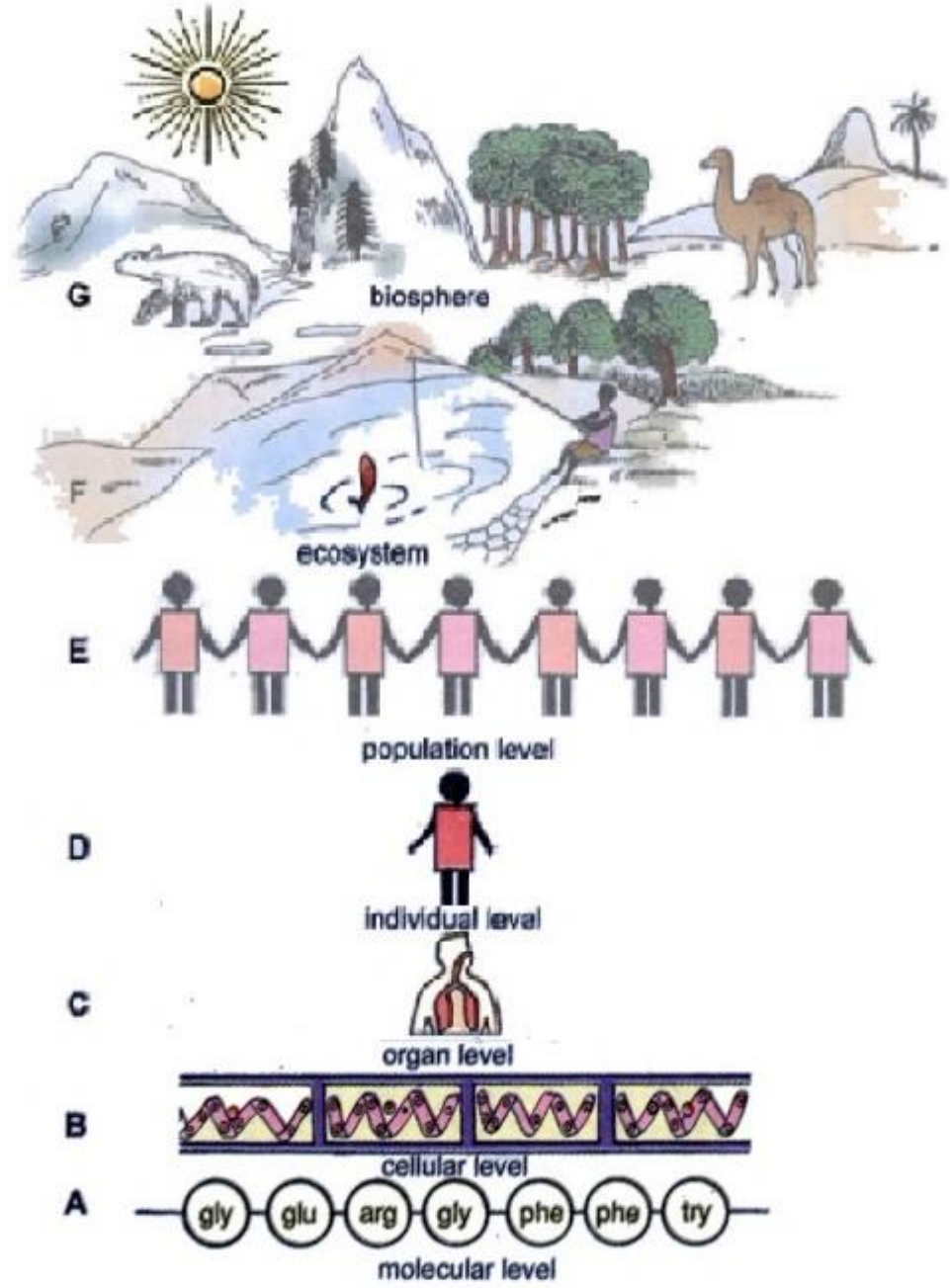


Fig. 1.2. Levels of organization (diagrammatic)

There are three levels of biodiversity namely:-

**Genetic diversity:** This refers to the variety of genes within a species of plant or animal. Healthy plant and animal populations have a genetic variety, that is, they are not all from the same small number of parents. Genetic diversity serves as a way for populations to adapt to changing environments. Example of genetic variations in dogs is the difference in skin colour, ears, eyes and body shape.

**Species diversity:** This refers to the variety of types of plants, animals, and micro -organisms.

**Ecosystems diversity:** This refers to the variety of natural systems which provide the homes or habitats and services for all organisms. Examples of ecosystems diversity are forests, mountains, rivers, lakes, wetlands, oceans and deserts.



# Biodiversity and Spatial Scales

Extinction usually refers to the disappearance of a species from the earth, but the term is also routinely used, with modifiers, to describe the disappearance of a species from a smaller area. For example, when a species disappears from a small area, this is called a *local extinction*, even though the area may later be recolonized by immigrants.

Endemic refers to species found only in a defined geographic area; thus, koalas are endemic to Australia.

The ecologist Robert Whittaker (1960) devised a simple system for classifying the scales at which diversity occurs; he described three scales of diversity as alpha, beta, gamma (A, B, C in Greek).

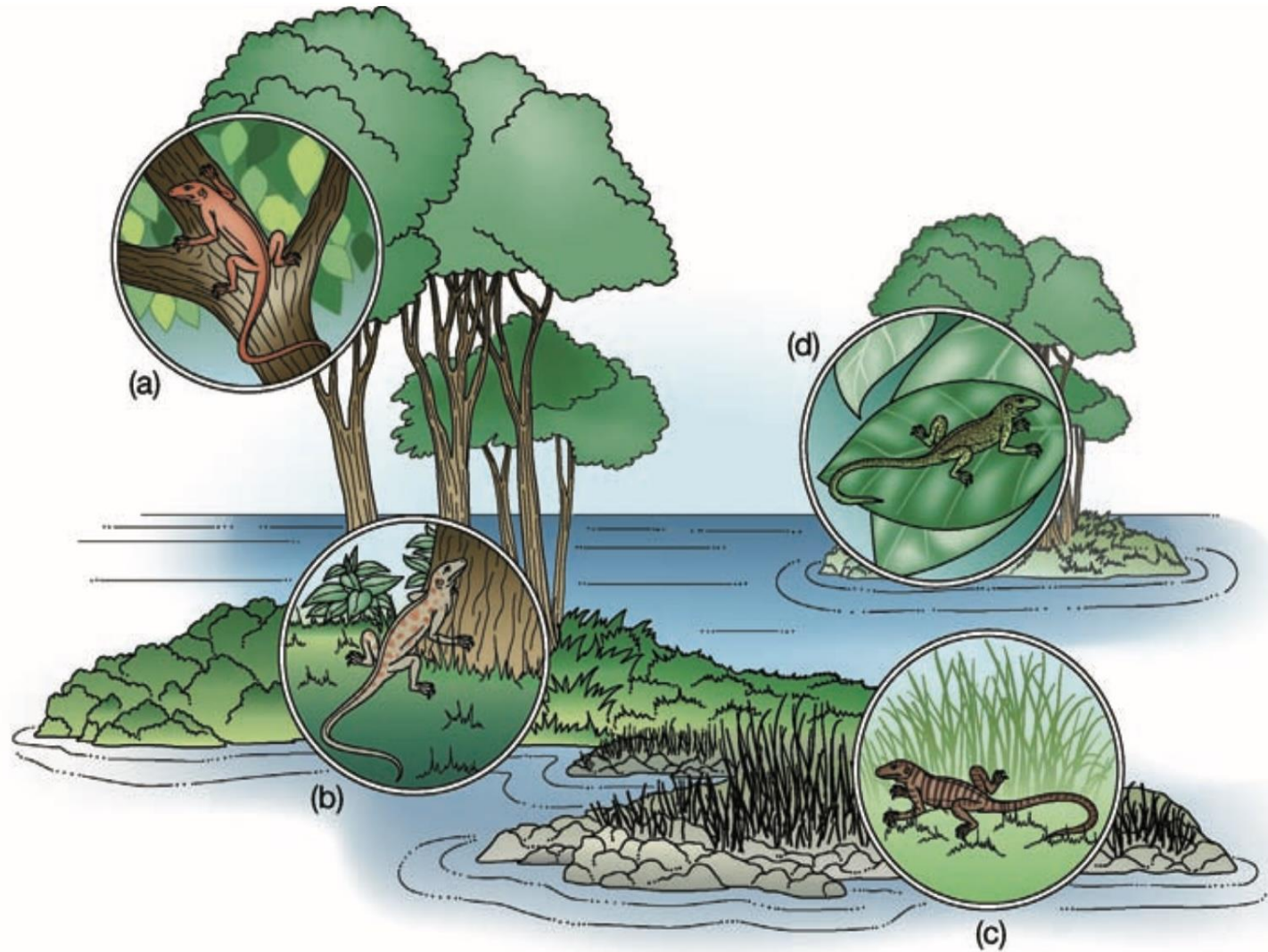
Alpha diversity is the diversity that exists within an ecosystem.

In Fig. 2.3 two hypothetical lizard species, spotted lizards and long-tailed lizards, illustrate alpha diversity by coexisting in the same forest, living at different heights within the forest.

A third species, banded lizards, illustrates beta diversity (among ecosystems diversity) by occurring in a nearby field.

Finally, if you imagine spotted, long-tailed, and banded lizards living on one island, and a fourth species, speckled lizards, living a thousand kilometers away on another island, this would represent gamma diversity, or geographic-scale diversity.

**Figure 2.3** The distribution of four hypothetical lizard species showing alpha diversity (within an ecosystem, A plus B), beta diversity (among ecosystems, A/B plus C), and gamma diversity (geographic scale, A/B/C plus D). See text.



# Importance of Biodiversity

Biodiversity is vital for supporting all life forms on Earth.

Biodiversity is the foundation of healthy functioning ecosystems upon which all life depends. Biodiversity provides the following ecological services: soil formation; nutrient, nitrogen, oxygen and carbon cycling; energy production; flood and erosion control; clean air; clean water; breaking down pollutants; pest and disease control; food and medicines.

# Biodiversity and Its Importance

## 1. Economic Values

### A. Food

Except for salt and a few other additives, everything we eat started out as an organism, an element of biodiversity. Often, we do not even recognize all the organisms involved: for example, the array of microorganisms that are essential in the production of cheese, bread, and alcoholic beverages.

### B. Medicine

Traditional medicines remain a conspicuous and valuable legacy of this past, especially in developing countries where most of the world's population resides, but also in industrialized countries where herbal medicines are worth billions of dollars per year

- shark liver oil, beeswax, corn oil, lanolin, and thyme oil.

### *C. Clothing, Shelter, Tools, and Trinkets*

Plastics, metals, glass, and concrete may constitute the bulk of materials people use today, but more traditional materials such as wood, cotton, thatch, sisal, wool, silk, leather, fur, and others remain very important to us.

### *D. Fuel*

One of the single biggest uses we make of other living creatures, as measured in tons, is burning them as biomass fuel. Of course, all forms of life are full of carbon and will burn given sufficient heat and oxygen.

### *E. Recreation*

A person's requirements for food, clothing, shelter, tools, and fuel are fundamental, but we also have emotional needs that drive our search for pleasure.

## F. Services

the pollination services rendered to farmers by bees and other species, the degradation of oil spills by bacteria, the aeration of soils and decomposition of organic matter by earthworms and many other organisms, and the removal of pollutants from air and water by plants and other organisms. the global value of pollination services has been estimated at \$200 billion.

### **2. Spiritual Values**

### **3. Scientific and Educational Values**

### **4. Ecological Values**

### **5. Strategic Values**