Date:15/03/2020 – 19/03/2020 **Biology AS**

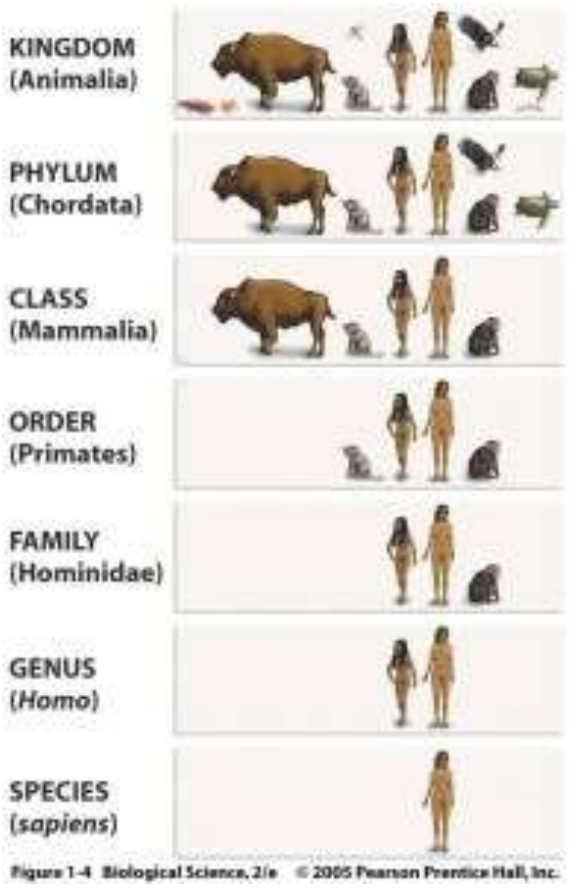

Figure 1-4 Biological Science, 2/e © 2005 Pearson Prentice Hall, Inc.

Classification

Taxonomy is the science of classification. It involves naming, and organising organisms into groups based on their similarities and differences. There are seven levels of groups involved in taxonomy, they are called taxonomic groups. Organisms are first sorted into kingdoms, and then it starts to break down into more subsections. As you go down there are more groups but fewer organisms in each group.

It ends with specie, which is where there is only one organism in it. Specie can be defined as: A group of similar organisms able to reproduce to give off fertile offspring.

All species are given a unique scientific name, in latin, it is binominal word, first with the genus and second with the specie.

There are five kingdoms, these are based on general features.

Kingdom	Example	Features
Prokaryoate	Bacteria	Prokaryotes, Unicellular, no nucleus, less than 5um
Protoctista	Alga, protozoa	Eukaryotic cells, usually lives in water, single celled or simple multicellular organism
Fungi	Mould, Yeast, Mushrooms	Eukaryotic, chitin cell wall, saprotrophic (absorb substances) from dead or decaying organisms
Plantae	Mosses, Ferns, Flowering plants	Eukaryotic, multicellular, cell walls made of cellulose, can photosynthesis, contain chlorophyll, autotrophic
Animalia	Molluscs, Insects, Reptiles, Birds, Mammals	Eukaryotic, multicellular, no cell walls, heterotrophic

Organisms can be reclassified, if once they have been revaluated, scientists agree with the new data, which shows the tentative natures of science.

There is also a three domain taxonomy being put forward. It is called molecular phyologeny. It looks at the DNA and Proteins and sees how closely related they area.

This new system suggests that the five kingdom should be changed to three, which are Bacteria, Achaea, and Eukaryote, these are super kingdoms and go above the kingdoms. The prokaryotic kingdom has been split into Achaea and bacteria when the other four kingdoms are now all in Eukaryote.

All organisms are given a unique scientific name. This is to avoid confusion that can arise when common names are used. There is a two part Latin name, which is called binominal system. The first part of the name is genus, it is shared by all closely related species, and the second part refers to the specific specie in the genus.

Phylogenetic trees represent the evolutionary relationship based on the best existing evidence, they are consistently being revised as new data becomes available.

SPECIATION

Speciation is the formation of a new species.

Species = A group of organisms with similar morphology, physiology and behaviour which can interbreed and are reproductively isolated from other species.

For a new species to arise, a group of individuals has to be reproductively isolated from the rest of the population. There are many factors, in addition to geographical isolation, why two species may not be able to breed and produce fertile offspring:

- Ecological isolation: Species occupy different habitats
- Temporal isolation: Species reproduce at different times
- Behavioural isolation
- Physical isolation: Physical factors preventing them from mating
- Hybrid inviability: Hybrids produced but don't live long enough to reproduce
- Hybrid sterilisation: Hybrid survives long enough to breed but is infertile

Biodiversity and Endemism

Biodiversity is the variety of all living organisms in an area. It includes species diversity (the number of different species, and abundance of each species in a area) and genetic diversity (the variety of alleles within a specie). Conservation is needed to help maintain biodiversity. Endemism is when an specie is unique to a single place, such as the giant tortoise.

Species diversity can be measured, and compared to different habitats. The number of different species in an area is species richness, the higher the number of species, the greater the specie richness. But it gives no indication of abundance of each species. Count the number of species and the abundance of each species, then use the biodiversity index to calculate the species diversity.

This is easily, Choose an area to sample, to avoid bias do it randomly. For plants use a quadrant, insects use a sweep net, for ground insects use a pitfall trap, and aquatic animals use a net.

Diversity within a specie is the variety shown by an individual of the species. Individuals of the same species vary because they have different alleles. Genetic diversity is the variety of alleles in the same gene pool of a population. The greater the variety the greater the genetic diversity.

To measure it looks at two things, Phenotype and genotype. For phenotype look at the characteristics of the organism. Such as there is a greater genetic diversity in eye colour in northern Europe. To measure genotype you need a sample of the organisms DNA.

Measuring biodiversity

Specie richness is the simplest way to measure biodiversity, this involves counting all the species present in a given habitat.

Specie evenness is when you use specie richness but you take into account the population size of each of the species.

Usually in an ecosystem there is a dominant organism. This is the most common specie in the habitat. In English woods it is often the Oak tree.

Adaptation and evolution

A niche is a role of specie within a habitat. A niche a specie occupies within a habitat includes its interactions with other living organisms, and its interactions with the non-living environment. Every specie has a unique niche, and a niche can only be occupied by one specie, there is always a slight difference between the niches.

There are three ways to which an organism can be adapted to their niche:

Behavioural adaptations	Ways an organism acts that increases its chances of survival and reproduction.
Physiological adaptations	Processes inside an organism that increases its change of survival
Anatomical adaptations	Structural features of an organism's body that increase its change of survival

Useful adaptations become more common within a population of species because of evolution by natural selection. Individuals within a population show variation in their phenotype, predation, disease and competition create a struggle for survival, so individuals with better adaptations will perform better and are more likely to survive. This is an outline of Charles Darwin's theory of evolution by natural selection. An example is the peppered moths, which showed a variation in colour, light and dark, with due to industrial revolution the populations of each varied.

Taxonomy and classification

Classification - A means of organising the variety of life based on relationships between organisms using differences and similarities in phenotypes and in genotypes.

Classification can be artificial, such as organising groups of organisms by visible similarities like the ability to fly; or classification can be based on evolutionary origins - this is known as phylogenetic classification. A species is defined as a group of organisms that can successfully breed to produce fertile offspring and who share similar characteristics; this is important to classifying organisms and also telling apart different species.

Originally, classification was more artificial and based around human judgement, but as technology and biochemistry have developed the classification of organisms has been refined to molecular observations of the cells they contain and comparison of DNA, allowing classification to develop and focus more on phylogeny. Comparison of DNA base sequence, mRNA or polypeptides can be used to observe how closely organisms are related and how recently they shared a recent common ancestor from which both species developed.

The scientific community evaluates data, such as data that may influence the classification of organisms, in the following ways:

● The findings are published in scientific journals and presented in scientific conferences.

● Scientists then study the evidence in a process called peer review

● Scientists start collecting evidence to either support or reject the suggestion.

The current classification system first groups organisms into 3 domains –

● Bacteria

● Archaea (primitive bacteria often found in extreme environments)

● Eukaryotes (plants, animals, fungal cells and protists)

From there, each domain is classified into smaller, non-overlapping groups called taxons. The order of taxons in the phylogenetic classification system is domain, kingdom, phylum, class, order, family, genus and species. All organisms are universally named using the binomial naming system which consists of the genus and the species, for instance humans are universally named the ‘Homo sapiens.

Mrs. Nisha Thomas