Welcome to the module from Molecular Biology and Evolution course ZOC107 for the programme Bachelors of Science for 3rd year, semester 5. Myself Dr. K. K. Therisa, assistant professor from Dhempe College of Arts and Science, Miramar. The name of the module is Population Genetics, Gene pool, Frequency and Equilibrium, under the Unit 8- Genetic basis of evolution and study of fossils.

The outline of the module comprised of population genetics in the beginning followed by Mendelian population and its characteristics, gene pool, gene frequency, and equilibrium.

Learning outcome, the student will be able to understand population genetics and Mendelian population, learn about gene pool, Explains gene frequency and equilibrium.

A population is a group of organisms of the same species that live in the same area and interbreed producing fertile offspring's. According to Neo Darwinism or modern synthetic theory. Evolution is regarded as a variation in the gene frequencies or allele frequencies in a gene pool of a population or species by the action of natural forces that is Natural selection, it may be because of genetic drift or gene flow, and all this causes variations in the gene pool in the gene frequencies and that actually alters the population and causes evolution.

Population genetics is the study of these variations in the allele frequencies or the gene frequencies in a population and the causes of such variations. Evolution occurs when the individuals in a population differ genetically. Population evolves by gathering variation in its gene pool expands from its related population and changes finally into a new species. Population genetics initiated as understanding of Mendelian inheritance and Biostatistics models in the Mendelian population. The Hardy Weinberg law of equilibrium provides the solution to how genetic variation is maintained in a population with Mendelian inheritance. Population genetics explains the mechanics of how evolution in a population takes place.

To understand population genetics, some of the other concepts such as Mendelian population, Gene pool, gene flow, gene and genotype frequency, and the law of equilibrium need to be studied. Many evolutionists and geneticists have defined Mendelian population as a local population or a community of sexually interbreeding or potentially interbreeding individuals living within a given geographical area at a given time.

Characteristics of a Mendelian population are the individuals or Mendelian population shows similar genetic constitution and gene arrangement, except for distinctiveness. It shows genetic variation. A population possesses a gene pool and all the adherents of the population share in the same gene pool donate to it. And due to interbreeding, there is free gene flow among all the individuals of the population.

Besides each associate of a population has equal chances of mating with the opposite sex in the population. Inter population Interbreeding is found to be occasional and intra population interbreeding is very frequent. The gene pool of the entire species gets reshuffled continuously because of infrequent breeding between individuals of associated population. Also, their gene pool is interconnected.
Moving on to the concept of gene pool. Gene pool is the sum total of the copies of every type of allele at every locus in all the members of a Mendelian population.

The alleles or genes are found in the individuals and with the help of gametes are passed on to next generation. Gene Pool can be also considered as gametic pool as gametic pool is defined as the sum total of alleles present in the gametes of a Mendelian population.

Study of Gene Pool provides, the evidence about the types of alleles in the population, which is an important concept in the study of population genetics. The proportion of different alleles is also been studied using study of gene pool and how they are distributed in the individuals can be understood. If only one allele exists for a particular locus in a population, then it is called as a fixed allele in the gene pool.

That means all the individuals are homozygous for that allele. If there are two or more alleles for a particular locus in a population, it's individuals are both homozygous and heterozygous. The gene pool of a population maintains its integrity. If there is no interbreeding between populations. Interbreeding leads to gene flow. And gene flow leads to mixing and reshuffling of gene pools. And size of gene pool depends on the number of genes and individuals carrying these genes.

It may be large if it is affected by immigration and mutation. The gene pool maybe of a small size. If there is immigration, natural selection and genetic drift.

Moving on to the gene frequency and equilibrium. Gene Pool maintains or tries to maintain a dynamic equilibrium in gene frequency and genotype frequency. Gene frequency refers to the proportion of an allele in the gene pool as compared with other alleles at the same locus, with no regards to their distribution in organisms. While genotype frequency is the total number of one kind of individuals from a population, all of which exhibit similar character with respect to the locus under considerations. Some level of genetic variation for many characters are found nearly in all populations. To measure this genetic variation in Mendelian population, one has to count all alleles at every locus in each individual in it, and this will provide a gene frequency or allele frequency. But in sexually reproducing diploid populations the homozygous and heterozygous genotypes are formed due to the combination of alleles present in the eggs and the sperm.

The proportion of alleles of one type at 1 locus in the gametes may be known as gametic frequency and the total number of individuals having same genotype for one pair of alleles represent the genotype frequency. Genetic population involves the sum of gene or allele frequencies for all the genes embodied by that population. It follows that for evolution of a species to occur, the gene frequencies of that population must undergo variation. At the same time, if there is no evolution within the population the genetic equilibrium occurs.

These are the references used to prepare this module.

Thank you.