Quadrant II – Transcript and Related Materials

Programme: Bachelor of Science (Third Year)

Subject: Zoology

Paper Code: ZOC 107

Paper Title: Molecular Biology and Evolution

Unit: 7

Module Name– Classification and Types of Isolating Mechanisms.

Module No: 50

Name of the Presenter: Ms. Juliana Silveira e D'Souza.

Notes:

The field of biology describes **"Isolation"** as a process by which two species that could otherwise produce hybrid offspring are prevented from doing so.

Isolation is the separation of individuals of a species by some barrier, which prevents interbreeding. When interbreeding is prevented, gene flow between population is prevented . Each population in isolation develops genetic divergence independently,

leading to the formation of new species. Isolation is an important factor contributing to the process of evolution.

Isolation is the segregation of the population of a species into smaller units or sections or the segregation of individuals of different species by certain mechanisms, so as to prevent interbreeding among them and help in maintaining their integrity.

The agency which brings about isolation is called **isolating mechanism**.

Isolating mechanism is a barrier which prevents interbreeding between

populations. When interbreeding is prevented, the gene flow between populations is also prevented, isolation prevents the exchange of genes between populations.

Hence, the occurrence of new variation in one population has no effect on other populations.

The term **isolating mechanism** was first coined by **Dobzhansky** (1937).

Romanes stated that without isolation or the prevention of interbreeding,

organic evolution in no case is possible. The isolating mechanisms serve as external as well as internal barriers.

Isolating Mechanisms

Mayr has distinguished three main types of isolating mechanisms:

Restriction of random dispersal : where the potential mates cannot meet.

Restriction to random mating : that does not allow crossing, though the

individuals meet.

The reduction of fertility : the hybrid that if produced is sterile.

Dobzhansky described only two types of isolating mechanisms :Geographical isolation and Reproductive isolation

Goldschmidt stated only one type : Genetic isolation

Recently , **Mayr** and **Stebbins** have classified the isolating mechanisms into following types :

Classification of Isolating Mechanism in Animals

Mechanisms that prevent interspecific crosses (preventing / premating

mechanisms)

a. Potential mates do not meet.
b. Potential mates meet but do not mate.
c. Copulation attempted but no transfer of sperms takes place.

Mechanisms that reduce full success of interspecific crosses (post mating

mechanisms)

a. Sperm transfer takes place but egg is not fertilized.
b. Egg is fertilized but zygote dies.
c. Zygote produces an F1 hybrid of reduced viability
d. F1 hybrid zygote is fully viable but partially or completely sterile,

or produces deficient F2

Mecham proposed the following classification :

1. Isolating Mechanisms which prevent interspecific crosses (premating mechanisms)

A. Potential mates do not meet

2. Isolation due to distances

3. Climatic isolation

4. Seasonal isolation

5. Habitat isolation

B. Potential mates meet but do not mate

6. Ethological isolation

C. Copulation attempted but transference of sperms does not occur

7. Mechanical isolation

8. Physiological isolation

2. Isolating Mechanisms which reduce full success of interspecific crosses (post mating mechanisms)

A. Sperms are transferred but Eggs are not fertilized.

1. Gametic mortality

B. Egg is fertilized but Zygote is unviable.

2. Zygote mortality

C. Zygote produces F1 hybrid of reduced viability.

3. Hybrid inviability

D. Hybrid is viable but partially or completely sterile.

4. Hybrid sterility

Other Types of Isolation

Biotic Isolation

Any species of animal or plants is always surrounded by other types. Each species affects all the other species with which it is spatially associated, every species is a part of biotic environment of all the others. If, then, the biotic environment varies within the range of the species, the pressure of selection will vary and certain characters will appear favourable for one biotic condition.

Psychic Isolation

Among lower animals, there is tendency known as “assortative mating” which means to mate with like types. In human beings, this conventional mating is highly developed.

In many insects, copulation occurs without elaborate courtship behaviour. Females readily accept only males which observe the courtship behaviour characteristic of their species.