Quadrant II – Transcript and Related Materials

Programme: Bachelor of Science (Third Year) Subject: Zoology Course Code: ZOC 109 Course Title: Environmental Biology and Toxicology Unit III: Population Dynamics Module Name: Biotic Potential and Environmental Resistance Name of the Presenter: Dr. Subhash H. Bhosale Associate Professor P.E. S's R.S.N College of Arts and Science Farmagudi, Ponda- Goa

Notes

Biotic Potential is the ability of a population of a particular species to propagate under suitable environmental conditions- Sufficient food supply, no diseases and no predators.

Environmental Resistance are factors that limit the biotic potential of an organism. It includes abiotic and biotic factors.

Biotic Potential increases the population of a species while environmental resistance decreases its growth.

Biotic Potential

R.N Chapman (1928) defined Biotic potential as "The inherent property of an organism to reproduce to survive. It is a sort of algebraic sum of the number of young produced at each reproduction, the number of reproductions in a given period of time, the sex ratio and their general ability to survive under given physical conditions."

Biotic Potential is the unrestricted growth of populations resulting in the maximum growth of that population. It is the highest possible vital index of a species. Hence, when the species has its maximum birth rate and lowest death rate.

Biotic potential among organisms varies from species to species. It is the ability of the population of living species to increase under ideal environmental conditions such as sufficient food supply, no predators, and lack of disease. The primary determining factors for Biotic Potential are organism's rate of reproduction and the size of each litter. It is the quantitative expression of the ability of a species to face natural selection in any environment. Biotic potentials of organisms can be attributed to several factors such as survival rate of their offspring, frequency of reproduction and reproductive life span.

R.N Chapman has classified Biotic Potential into two types:

1) Reproductive Potential (Potential Natality): It is the upper limit to biotic potential in the absence of mortality. It does not account for the number of gametes surviving.

2) Survival Potential: It is the reciprocal of the Mortality. Survival potential is a necessary component of Biotic Potential. In absence of Mortality, Biotic potential is equal to Reproductive Potential. Survival potential can be divided into two:

- i) Nutritive Potential is the ability to acquire and use food for growth an energy.
- ii) Protective Potential is described by ability of the organism to protect itself against the dynamic forces of environment in order to insure successful reproduction and offspring.

The primary factors which determine biotic potential are organism's rate of reproduction and its litter size. Biotic potential among organisms varies from species to species. However, it refers to the ability of a population of a particular species to propagate under ideal environmental conditions.

Environmental Resistance

The factors that limit biotic potential of an organism are known as Environmental Resistance. It is the sum of the environmental factors such as drought, mineral deficiencies and competition that tend to restrict the biotic potential of an organism or kind of organism and impose a limit of numerical increase. These factors lower the chances for reproduction, affect the health of individuals and increase the death rate in the population. Environmental resistance factors include Biotic (Predation, competition, parasitism and diseases) and Abiotic

(environmental conditions, fire, temperature etc.) The resistance presented by the environmental conditions to limit a species from growing out of control or to stop them from reproducing at maximum rate.

Limitations to population growth are either density dependent or density independent factors.

- Density dependent factors- It causes higher mortality or reduced birth rates as a population becomes denser. It is usually, biotic. Example: Disease, competition and predation. It may influence size of the population by changes in reproduction or survival.
- 2) Density independent factors- It refers to any influences on a population's birth or death rates, regardless of population density. It is usually, abiotic. Example: Temperature, natural disasters and oxygen level in the temperature. These factors apply to all individuals in a population irrespective of density.

Both Biotic potential and environmental resistance affect the carrying capacity, which is known as the maximum population of a species an ecosystem can sustain indefinitely without being degraded.