

2022 : Plants and animals that exist in a particular ecosystem are those that have been successful in adjusting to their habitat and environment conditions. Elucidate with examples

and

2019 : Amensalism is a biotic factor that determines the geographic limits of species. Explain

Frame In both these questions environmental gradient as determiner of habitat is required to be specified.

2022 question requires coverage of all aspects of adaptations by plants and animals – also natural selection.

2019 question is more specific with biotic interactive relation, though introduction in both the questions will involve envt.

We thus are creating different answers to both the questions.

Answer (2022) The science of ecology, deals with the ways in which organisms are moulded by their surroundings, use their surroundings and alter it with their presence. These interactions involves energy and matter, living things requires to assure their survival

Everything that affects an organism during their lifetime is environment. It is subdivided as Abiotic factors - as sun, climate, soil - and Biotic factors - including all forms of life - plants, animals, bacteria etc.

Limiting factor of envt determines success of species. It may be abiotic/biotic and is quite different from one species to the other. Eg - amount of grass available as food for grazing animals or salinity of water for oceanic animals, amount of sunlight for plants etc.

Mutualistic interactive relation between organism and environment includes - habitat and niche.

Habitat of an organism is space that it inhabits. The particular biological requirements of an organism determine the kind of habitat in which they live.

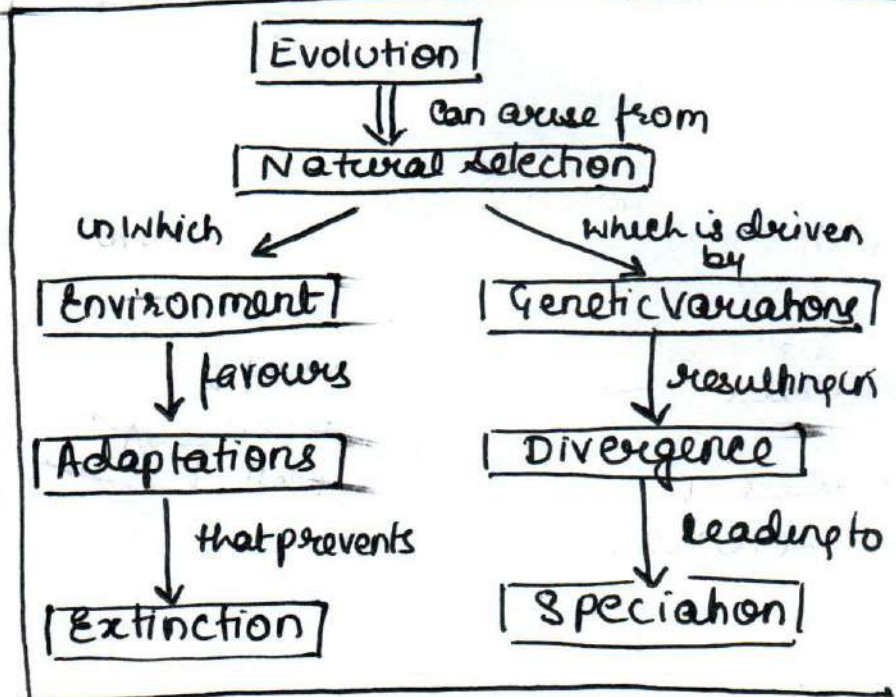
Niche of an organism is functional role. It has in its surroundings. It includes everything that affects the organism and everything affected by the organism during its lifetime.

⇒ Each organism is thus finely tuned to a particular habitat and have specific niche within its habitat.

The process that leads to this close fit between organism and their environment is known as natural selection. It is the process of more successful individuals surviving and reproducing larger number of offsprings than those that are less successful.

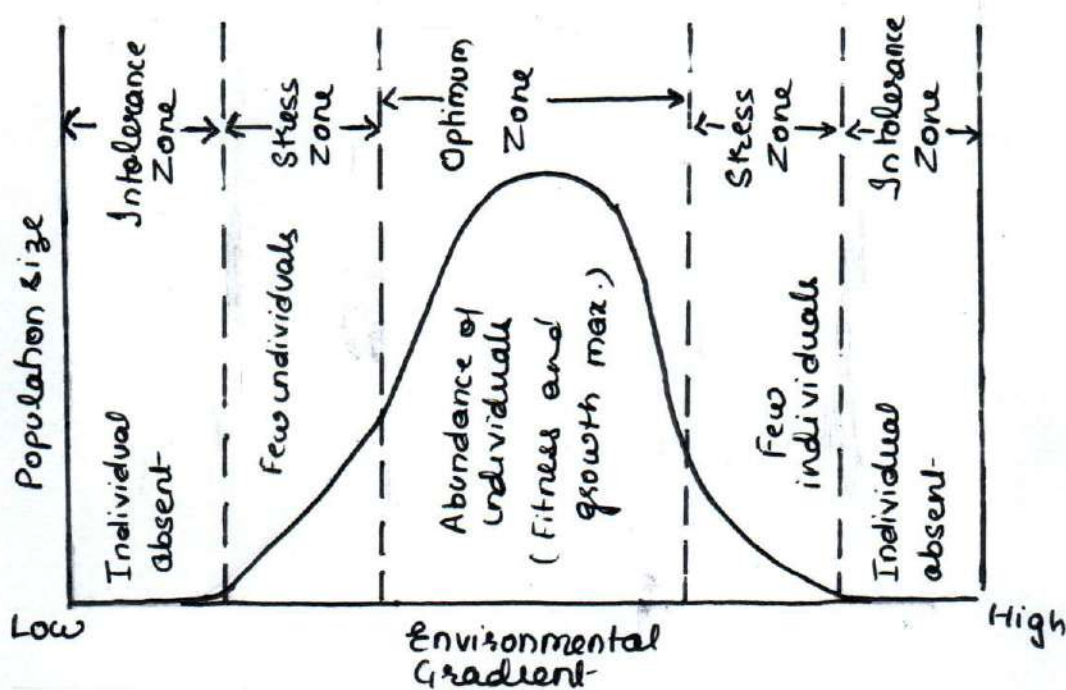
In 1859 Charles Darwin introduced the theory of natural selection. He outlined several factors to interact in facilitating natural selection -

- i) Individuals within species showed variations - some of the variations were useful while others were not. Eg. individual animals that are part of same species show colour variations - making them more conspicuous or less conspicuous
- ii) Organisms within a species typically produce many more offspring that can survive - that is there is not enough suitable habitat for all offsprings to grow to maturity
- iii) excess no. of individuals, some have greater chance of surviving and reproducing than others.
- iv) variations among individuals in excess number results in struggle for survival. Individuals must compete with each other for food, space, mate etc.
- v) As time passes, each generation subjected to same process - will lead to - individuals with favourable variations increasing in number with better adaptations



2019 - Amensalism - geographic limit of species

Answer Species range is geographic area where a particular species lives. It essentially includes areas where individual migrate or hibernate as well. Every living species have its own geographic limit, some have wide range, while other lives in very ltd area. Accordingly, species with wide ranges that covers most of earth have cosmopolitan - every - distribution as blue whales or humans. While species with limited range have endemic - steno - distribution. The physical determiners of geographic limit includes climate (temp, water) nutrient, ph value of water etc.

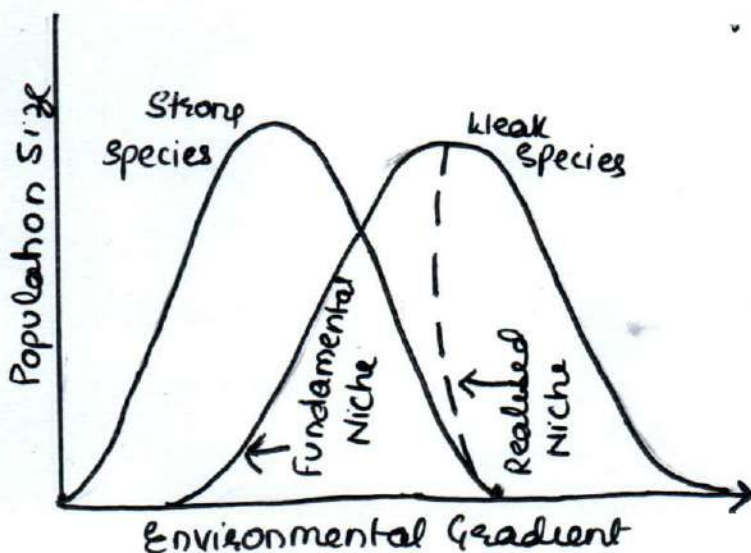


Among the biotic determiners multiple interactions among biotic communities plays variable determining roles - Some of these are facilitating (beneficial) as symbiosis, some are detrimental as competition and some are neutral- neutralism

- Amensalism is essentially negative type of ecological interaction where one of the species is harmed or destroyed while other either benefits or remains neutral. It is considered to be one of the modes of evolution as the process of natural selection favouring organisms that can effectively collect nutrients and energy for survival.

In most of amensalism interaction - the species causing harm produces chemicals or other products (as normal working or as defensive strategies) that negatively impact other species.

It also involves competitive interaction where niche of organism is influenced.



- Amensalism thus can influence all the three ecological aspects of niche- spatial, trophic and hypervolume, influencing geographic limit of species

Accordingly Amensalism as biotic factor can induce

- Competition
 - Antibiosis
-] to modify geographic limits of species

Competition

- as a negative interaction makes larger/stronger species depriving smaller/weaker species of food and living space. Larger/stronger species remains unaffected, whereas smaller/weaker species suffers from scarcity of nutrients & living space influencing their geographic limit
- eg interaction with same type of ecological (food) niche between goat and grasshopper - limits geographic range of grasshopper with goat remaining unaffected

Antibiosis

- is antagonistic relation between species colonising similar ecological niche (spatial) one organism produces antibiotics as form of defensive mechanism against possible predators - that acts as toxins for other species
- it is considered to be case of interference competition where one species inhibits the development of other and gains access to bigger geographical niche.
- eg Penicillium and bacteria.