

## 2-2: Interspecific populations :

### ( two species population interactions ): ..... Lecture 9

All populations of living organisms exist in a network of interactions with other populations . Two major types of interactions may be occur within populations of two species , namely the positive interactions and the negative interactions . The positive interactions are cooperative and beneficial to one or more of the interacting species ; whereas the negative interactions are competitive or limiting to the interacting species . The positive interactions are represented by " commensalism " and " mutualism " , which are special types of symbiosis . The negative interactions are represented by " predation " , " parasitism " , " competition " and " amensalism and antibiosis " . Types of interactions within two - species population and their general natures are summarized in table - 1 .

**Table -1 : Analysis of Two - species population interactions**

Type of interaction	Species	General nature of interaction
	1    2	
1- Commensalism	+    0	Species 1,the commensal benefits, 2 the host not affected
2 - Mutualism	+    +	Interaction favorable to both and obligatory
3 - Predation	+    --	Species 1 ,the predator, generally larger than 2,the prey
4 - Parasitism	+    --	Species 1 , the parasite, generally smaller than 2, the host
5 - Competition	--    --	Inhibition of each species by the other
6 - Amensalism & Antibiosis	--    0	Species 1 inhibited , 2 not affected

#### 1- Commensalism :

Two populations interacting in such a way as to be beneficial to one and neutral to the other, is referred to as " commensalism " . An example of commensalism is the remora - shark relationship, where the remora fish attaches to the skin of the shark by means of a strong sucker disc and is transported widely and rapidly by the shark's movement . The remora also consumes remaining food from the jaws of the shark .Thus , the remora benefits in two ways from this attachment , and the shark is relatively unaffected .

#### 2 - mutualism :

Mutualism is that relationship where both interacting populations benefit or are positively stimulated by the association . Classic example of mutualism is the association of algae and fungi to form lichens . Fungi provide the framework , moisture and attachment sites in which algal cells grow , and the algae provide food production for both itself and the fungi .

### 3 - Predation :

Predation is a relationship in which one animal species kills another animal for food . Studies have shown that the predators , such as lions and wolves , tend to capture the young , old and diseased individuals from the prey population . Thus , predation has been considered as a regulatory force on some prey population , since it eliminates only surplus individuals , which would eliminate by some other mortality factor if predation were not present .

### 4 - Parasitism :

Parasitism is an relationship in which one population derives its nutrition from another . It may be a temporary relationship , such as the ectoparasites ( lice , mites , ticks , mosquitoes , ...etc ) , or it may be a permanent relationship , such as endoparasites including intestinal worms in man ( tapeworms , roundworm , ...etc. ) and intestinal protozoa ( amoeba , ciliates and flagellates ). Parasites may weaken or may cause relatively little harm to the host , or eventually kill the host . Parasitism is universal interspecific relationship in all plants and animals .

### 5 - Competition :

Competition is the mutual utilization of limited resources . Studies have shown that two different species cannot occupy precisely the same niche , that is they cannot coexist with identical requirements for food and habitat . This called Gause's principle which states that " closely related species with very similar niche requirements often interact in such a way that one species displaces another " .This principle is called then " interspecific exclusion " or " competitive exclusion " . An classical example of competitive exclusion is the work of Gause on laboratory populations of *Paramecium caudatum* and *Paramecium aurelia* ( Fig 19 ) . When the two species cultured separately in the laboratory , each one grew well on the same bacterial food as medium , but when they cultured together , *P . aurelia* always displaced *P . caudatum* which excluded in approximately 16 days .

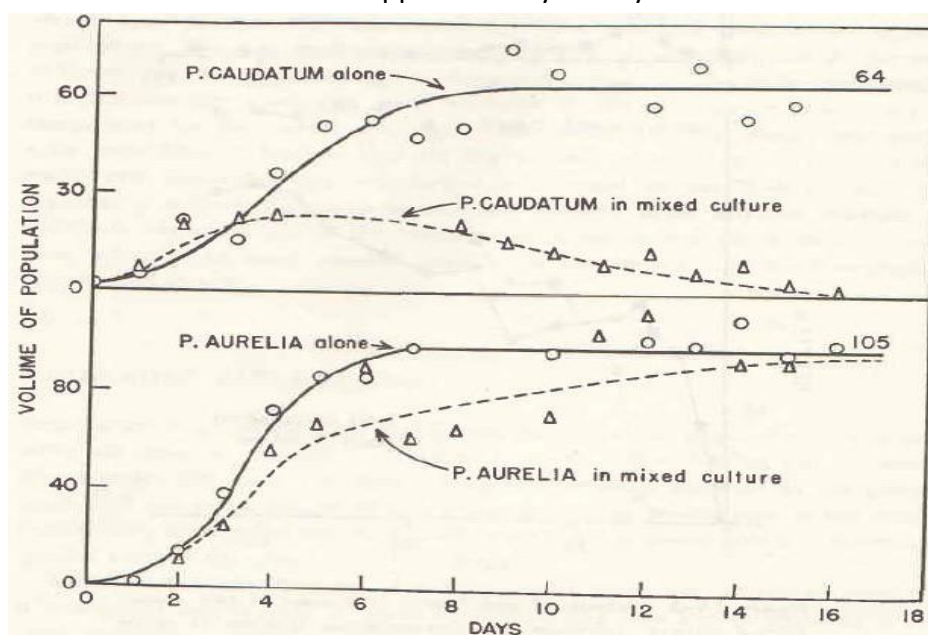


Fig .19 : Competitive exclusion between *Paramecium caudatum* and *Paramecium aurelia*

## **6 - Amensalism and Antibiosis :**

Amensalism is an relationship in which one population is inhibited and the other is unaffected . A simple example is the shading out of certain plants under tall trees .Hence only shade - tolerant plants with lower light requirements can survive as ground cover .

Antibiosis is a specific type of amensalism in which one species produces a metabolite that is toxic to other organisms . The best known example is the fungus *Penicillium* , which produces an antibiotic substance causing the death of many bacteria .