

## Topic 4 - Interactions Between Species Notes

- Different Species can interact in 3 different ways
  - o Competition
  - o Predation
  - o Symbiosis

Competition occurs when two or more individuals seek to utilize the same resource

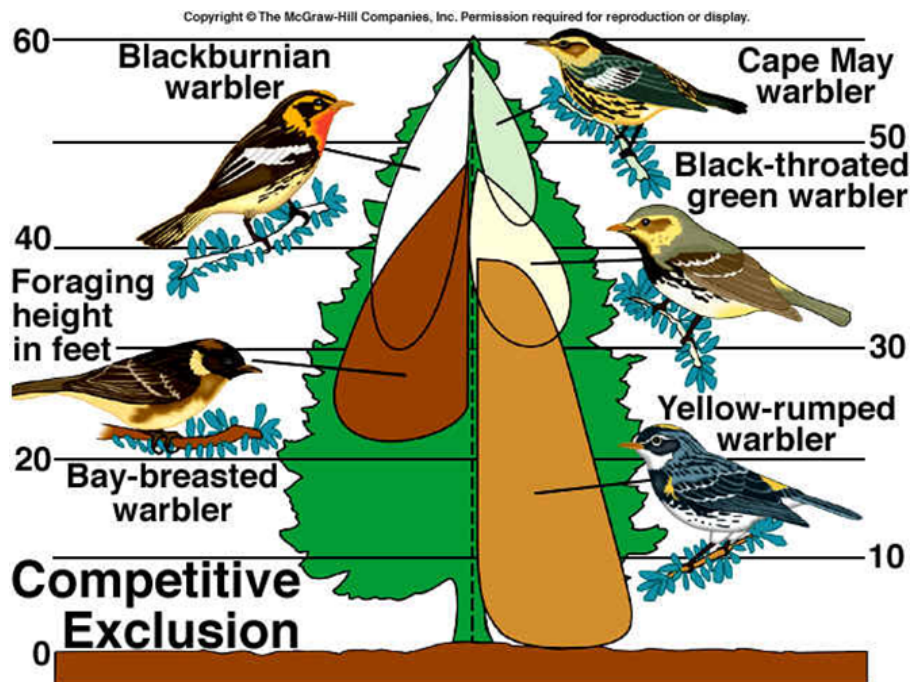
- Two types of Competition
  - o Interspecific Competition
  - o Intraspecific Competition

### Interspecific Competition

- Among members of different species for the same resource (food, habitat)

- Gause's Principle - if two populations occupy the same niche, one of the populations will be eliminated.

- o Example: Mountain Bluebird vs. European Starling
- o Example: Cheetahs and Lions
- o Example: Trees in a forest



Predation - when one species preys (eats) on another species

- Predator - the hunter
- Prey - the hunted
- Ex. A wolf is predator of moose (prey)



Defense Mechanisms - adaptations that prey species have evolved to prevent getting killed

- Mimicry
- Camouflage

Symbiosis - a relationship in which 2 different organisms live in a close association

- 3 main types of symbiosis
  - o Parasitism
  - o Commensalism
  - o Mutualism



- Parasitism

- o One organism benefits and the other is harmed
- o Parasite - live in or on another organism (host), from which they receive their food
- o Parasite doesn't kill host
- o Example: cowbird, lamprey, tape worm, tsetse fly

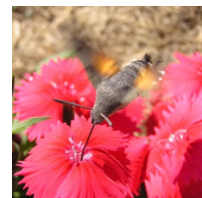
- Commensalism

- o One partner benefits and the other neither benefits or is harmed
- o Ex. Remora and shark, caribou and arctic fox, clownfish and sea anemone, whales and barnacles, orchids and trees



- Mutualism

- o Both organisms involved benefit from each other
- o Ex. Nitrogen fixing bacteria in roots of plants, Bacteria in our intestines, Nile crocodile and Egyptian plover, Flowering plants and pollinators



## DOCTOR FUN



More unusual examples of animal symbiosis

1. For each of the following examples, identify what type of interspecific competition is occurring and justify your answer. Make sure you have read pg 765

- (a) Argentine ants can displace indigenous ants from a community by rapidly depleting resources.
- (b) Some plants release toxins that kill or inhibit the growth of other plants, thereby preventing them from growing in close proximity where they may compete for space, light, water, and food.
- (c) In the Kibale Forest in Uganda, mangabey monkeys, a large species, drive away the smaller blue monkeys.
- (d) Hawks and owls rely on similar prey, but hawks feed during full daylight while owls hunt and feed from dusk to dawn. What term is used to describe this method of avoiding competition?

2. Identify the type of defence mechanism in each of the following examples (read pg 768):

- (a) Tiger moths have a highly detailed wing pattern that makes them virtually undetectable against tree bark.
- (b) When attacked by ants, ladybugs secrete a sticky fluid that entangles ant antennae long enough to allow the ladybug to escape.

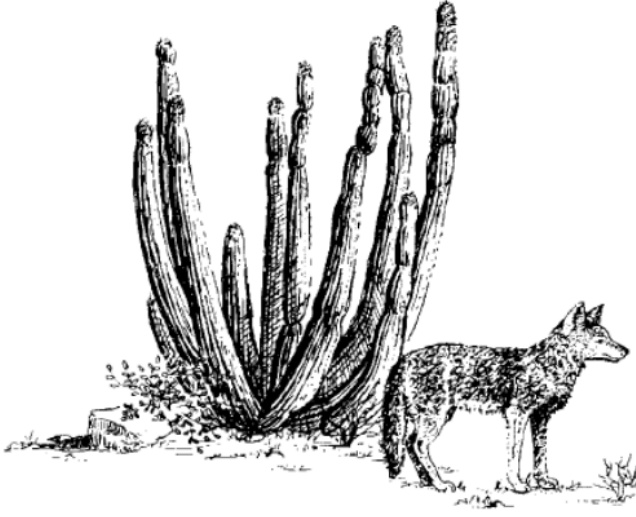
3. Termites eat wood but cannot digest it. They have unicellular, heterotrophic organisms called zoomastigotes living inside their digestive tract that do this for them. Identify the type of interspecific interaction between the termites and the zoomastigotes.

Use the following information to answer the next two questions.

### Organ Pipe Cactus

The organ pipe cactus has flowers that open at night. Bats and insects pollinate these flowers. The fruit of the cactus is eaten by birds and small mammals. Birds and small mammals scatter and distribute the fruit seeds. The coyote, in turn, feeds on the birds and small mammals.

— from *Naylor, 1995*



1. The relationships described above between the organ pipe cactus and insects, and between the organ pipe cactus and small mammals are identified in row

Row	Cactus and Insects	Cactus and Small Mammals
A.	predator–prey	predator–prey
B.	predator–prey	mutualism
C.	mutualism	mutualism
D.	mutualism	predator–prey

1. The flowers of the organ pipe cactus open during the night and close during the day to avoid dehydration during the heat of the day. This adaptation of the cacti to the desert climate **most likely** occurred as a result of

- A. increased mutation rates in flowers stimulated by high temperatures
- B. increased reproductive success of cacti with flowers that opened at night
- C. the intense heat of the desert, which destroyed all flowers that opened during the day and caused the cacti to open its flowers at night
- D. the reaction of the cacti to the extreme heat, which caused it to close its flowers during the day and to gradually develop the behaviour of opening its flowers at night

2. Gause’s principle states that when two different populations occupy the same ecological niche, one of the populations will be eliminated. Both the mallard duck and the red-winged blackbird occupy wetland areas. The duck and the red-winged blackbird can live in the same habitat because there is

- A. little intraspecific competition for food and breeding areas
- B. little interspecific competition for food and breeding areas
- C. significant intraspecific competition for food and breeding areas
- D. significant interspecific competition for food and breeding areas

Use the following information to answer the next question.

Harbour porpoises living off the northeast coast of Scotland have been found dead washed up on shore, the victims of violent, high-energy impacts. Zoologists have identified scratches on the dead porpoises that match the teeth of an unlikely killer, the bottle-nosed dolphin, long assumed to be playful and gentle. These two cetaceans (aquatic mammals), which share the same range and food supply, were thought to coexist peacefully.

—from *Discover*, 1996

What type of relationship do the bottle-nosed dolphin and the harbour porpoise exhibit?

- A. Symbiotic
- B. Predator–prey
- C. Intraspecific competition
- D. Interspecific competition

Use the following information to answer the next three questions.

Pacific herring play a key role in the marine food web of Canada’s West Coast. They are prey fish and comprise 30% to 70% of the summer diets of Chinook salmon, Pacific cod, lingcod, and harbour seals in the coastal waters of southern British Columbia. The eggs of Pacific herring are important to the diets of migrating sea birds, gray whales, and some invertebrates. Pacific herring are not mature enough to spawn until age three. Spawning takes place in coastal areas where algae beds are abundant and the water is uncontaminated.

Which of the following factors is an example of a density-independent factor that influences Pacific herring survival and growth?

- A. Algae populations
- B. Ocean temperatures
- C. Population of grey whales
- D. Imposition of fishing quotas

In the mid-1960s, a combination of intense fishing harvests and unfavourable ocean conditions caused the Pacific herring population to decline drastically. Which of the following rows shows the changes in relationships, after this decline, that were probably exhibited among organisms that prey on the Pacific herring?

Row	Interspecific Competition	Intraspecific Competition
A.	decrease	decrease
B.	decrease	increase
C.	increase	decrease
D.	increase	increase

Salmon fishing is an important industry on the West Coast of Canada. If the salmon population were to decrease because of overfishing, the Pacific herring population would probably remain relatively stable if other predators showed which of the following changes?

- A. Increased mortality and decreased emigration
- B. Decreased mortality and increased emigration
- C. Increased mortality and decreased immigration
- D. Decreased mortality and increased immigration

Use the following information to answer the next question.

### Examples of Ecological Relationships

- 1 Tropical acacia trees are hosts to a particular species of ants. The ants are provided with shelter and nutrients from the trees. The trees are protected from other predatory insects by the ants.
- 2 The protozoan *Opalina ranarum* lives in the digestive tract of some frogs and obtains nutrients in this way without harming the frog.
- 3 The protozoan *Plasmodium* is the cause of malaria. *Plasmodium* lives in the bloodstream of humans and reproduces inside red blood cells causing the red blood cells to burst.

### Numerical Response

8. Match the ecological relationships, as numbered above, with the types of symbiosis given below.

(Record your **three-digit answer** in the numerical-response section on the answer sheet.)

Ecological Relationship: \_\_\_\_\_  
Type of Symbiosis: Commensalism      Mutualism      Parasitism

## Topic 5 - Succession Notes

### - Succession -

- slow, orderly progressive replacement of one community by another during the development of vegetation in any area.
- begins when an area is partially or completely devoid of vegetation because of a disturbance
- Disturbance can be
  - Fire, volcanic eruption, glacier retreat

### - 2 types of succession

- Primary succession
  - Occurs on ground where no community has existed before
    - Ex. On a newly formed volcanic island or land released by glacier retreat
- Secondary succession
  - Occurs following partial or complete destruction of a community
    - Ex. Re-growth after a severe forest fire



### Steps in succession

#### 1. Pioneer community establishes itself

- Pioneer community - 1 species to appear during succession
  - Ex. Lichens, moss, insects
- Must be able to withstand intense solar radiation and extreme temp variation
- Most often r-selected populations
- Help form soil and microclimate
- As plants die they enrich soil and increase the amount
- Sets up conditions more favorable to other species

#### 2. New plant community begins to take over

- More tolerant of shade
- Taller than previous species
- Effective blockers of sunlight (this helps keep soils moist )

#### 3. Seral stages follow each other until a climax community is reached

- Seral stages - specific stages in succession identified by the dominant species present

#### 4. Climax community is established

- Made up of K-selected species



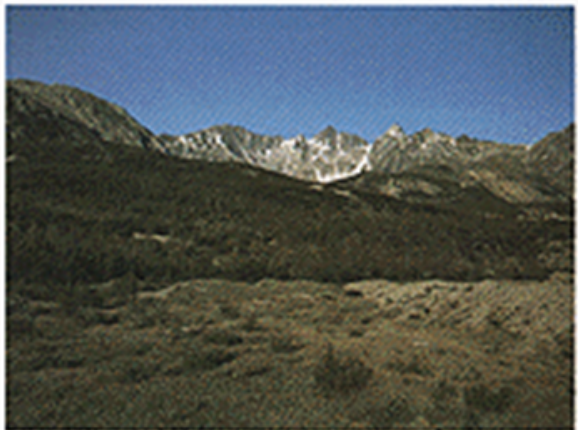
(a)



(b)



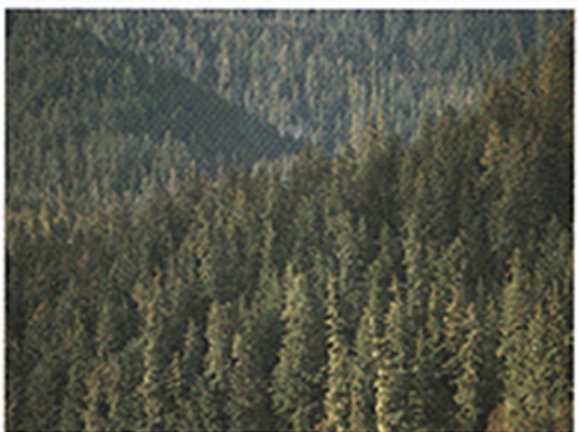
(c)



(d)



(e)



(f)



## Topic 5 Review Sheet

1. Distinguish between primary and secondary succession. Which of these processes would you expect to proceed more rapidly? Explain your reasoning.
2. What is meant by a climax community? How would you recognize a climax forest community?
3. Describe three ways in which pioneer plants alter the environment to make it more suitable for later-stage species. Describe two ways in which later-stage species alter the environment to make it less suitable for pioneer species.
4. Name two human activities that can result in secondary succession.
5. Aspen trees produce many extremely lightweight seeds that are carried long distances by the wind. In contrast, oak trees produce relatively small numbers of heavy seeds that fall to the ground and may be carried short distances by foraging animals.
  - (a) Which species would you expect to be an early succession species and why?
  - (b) What advantage might a large seed give to a plant that must germinate and survive in a late-stage mature forest with heavy shade?
  - (c) Would you expect pioneer or late-stage plant species to be more tolerant of dry conditions? Explain.
6. Jack pines produce cones with a waxy outer coating that protects the seeds from extreme heat. After exposure to very high temperatures, the cones open and release their unharmed seeds.
  - (a) How does such an adaptation make jack pine a secondary succession specialist?
  - (b) How might human forest fire management programs alter the ecology of jack pine forests?