

# ECOLOGY

The scientific study of the *interactions* between organisms and their *environment*. (Both *living* and nonliving.)

# SPECIES RELATIONSHIPS

- a. Autotrophs – (**Producers**) Organisms that use **energy** from the sun or energy stored in chemical compounds to **make** their own food. (**plants, algae**)
- b. Heterotrophs – (**Consumers**) Organisms that **depend** on autotrophs as their source of nutrients and **energy** (**Cannot** make their own food)



Does the bear directly or indirectly depend on the apple tree?

**BOTH**

# TYPES OF SYMBIOSIS

- ▶ Organisms live in close relationships for survival.
- ▶ Symbiosis – Close and permanent association between organisms of different species.
  1. Commensalism – Relationship in which one species **benefits** and the other species is neither **harmed** nor **benefited**.
  2. Mutualism – Relationship in which **both** species benefit
  3. Parasitism – Relationship in which one organism **benefits** and the other is **harmed** (It may harm the host, but usually does not **kill** it.) (ticks, **leeches**, tapeworms, **hookworms**)

# COMMENSALISM



Which organism(s) are benefiting?

# Mutualism



How is each organism benefiting from these relationship?

# Parasitism



What food source do these parasites depend on?

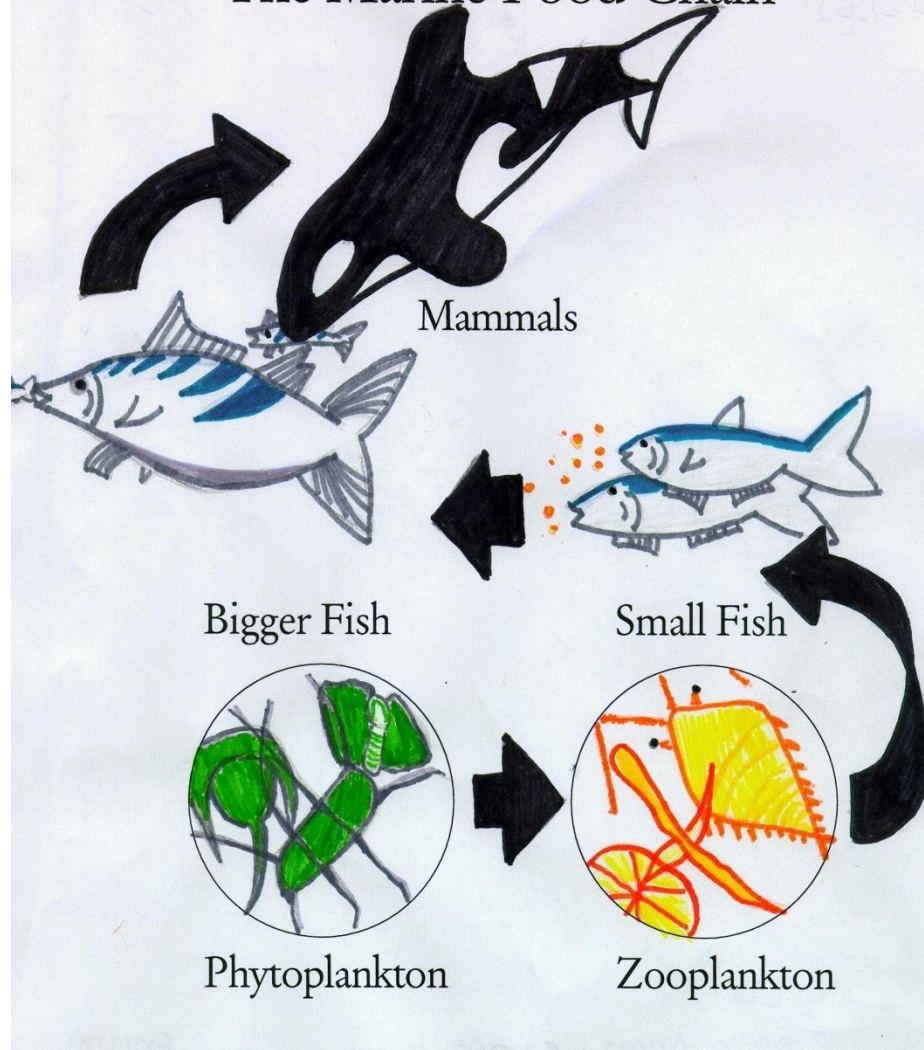
**Blood from their host.**

# Matter and Energy in Ecosystems

- Food chain – A simple model used to show how matter and energy move through an ecosystem (autotroph to heterotroph) pg. 69
- Food chains consist of 3 links, but have no more than 5 links due to the amount of energy decreasing
- Each organism in a food chain represents a feeding step (trophic level) in the passage of energy and materials

# Food Chains

## The Marine Food Chain



Name the 1<sup>st</sup> level consumers in this food chain.

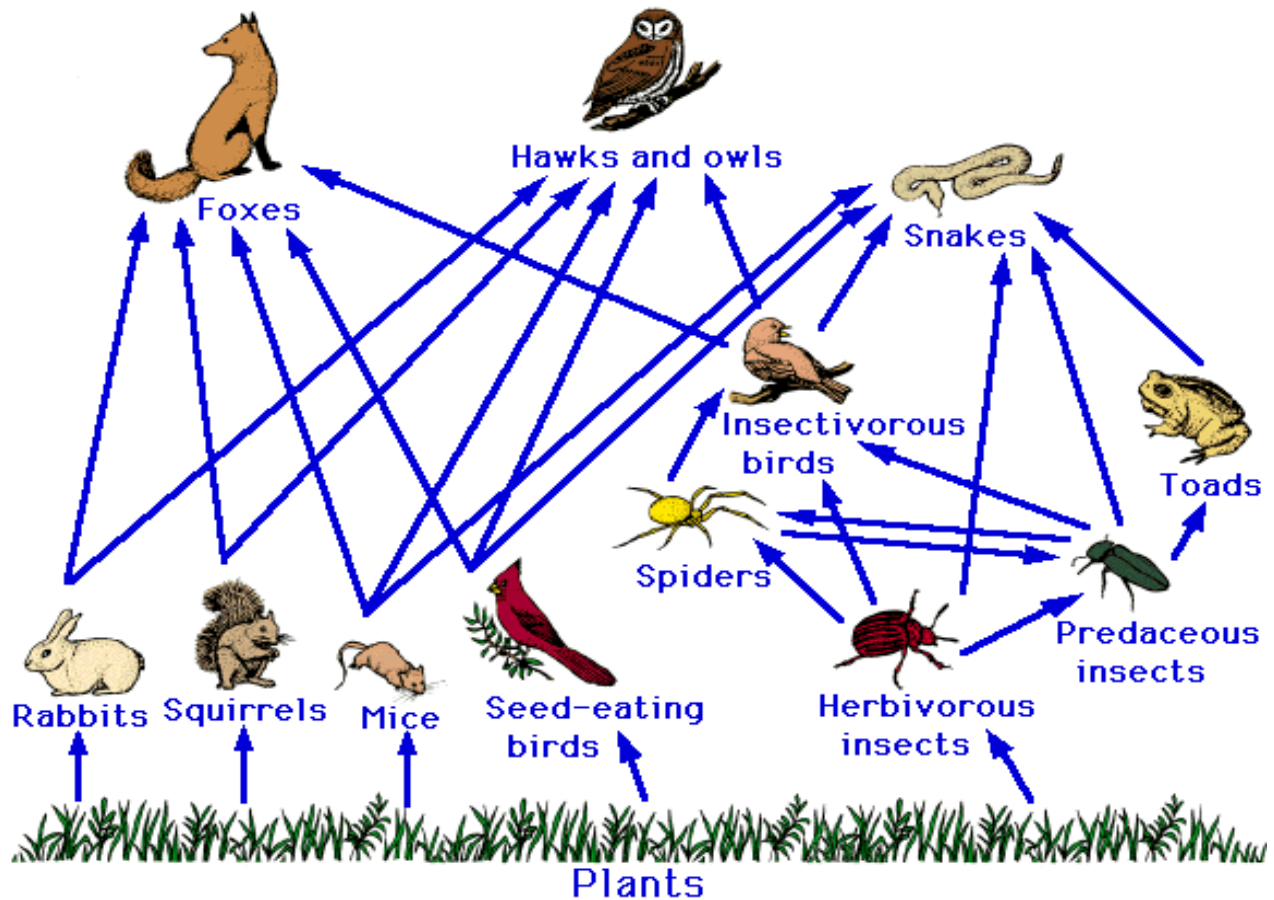
**Zooplankton**

# Food Webs

- Food web – expresses all of the ***relationships*** at each trophic level in the ***community***

What trophic level do spiders belong to?

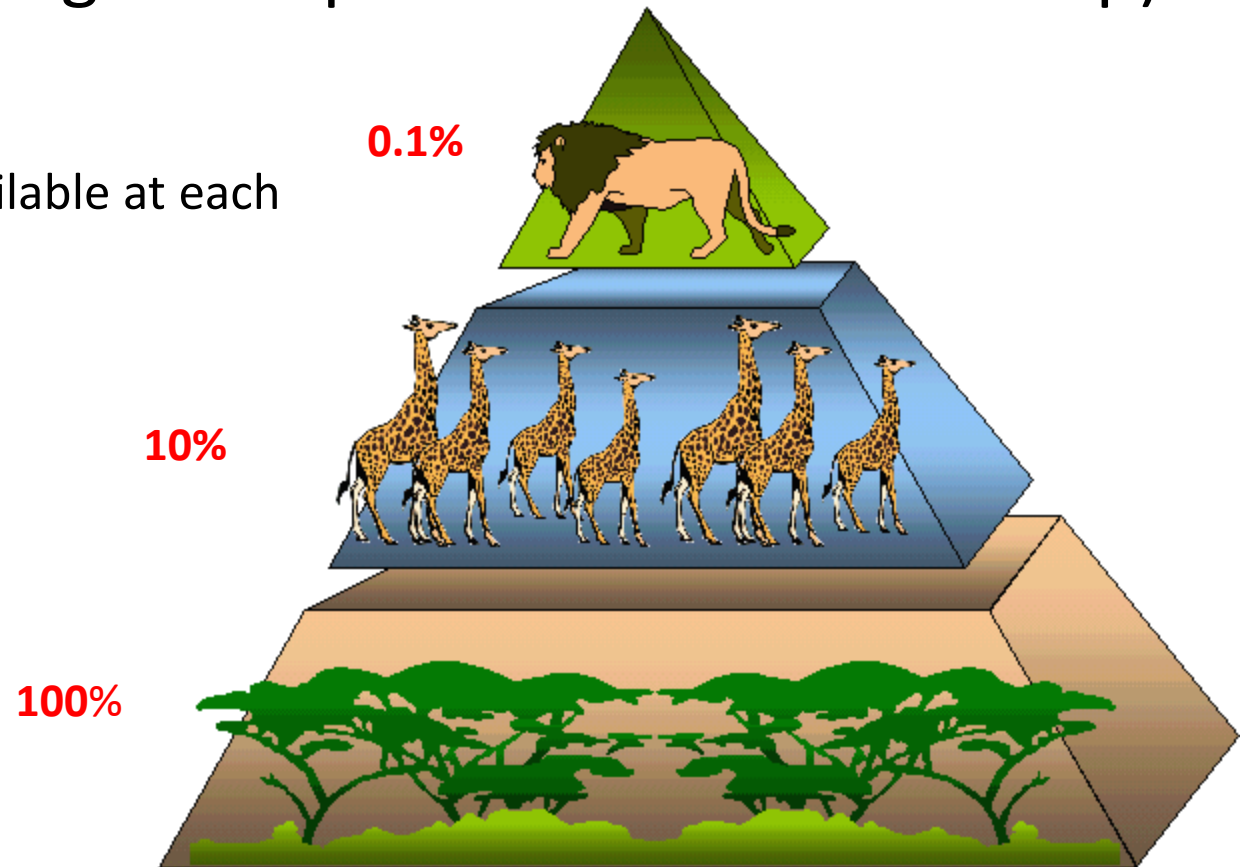
**2<sup>nd</sup> Level Consumers**



# Ecological Pyramid

- Ecological pyramid-depicts (shows) energy conversions in an ecosystem (producers are on the bottom, higher trophic levels are on the top)

How much energy is available at each level?

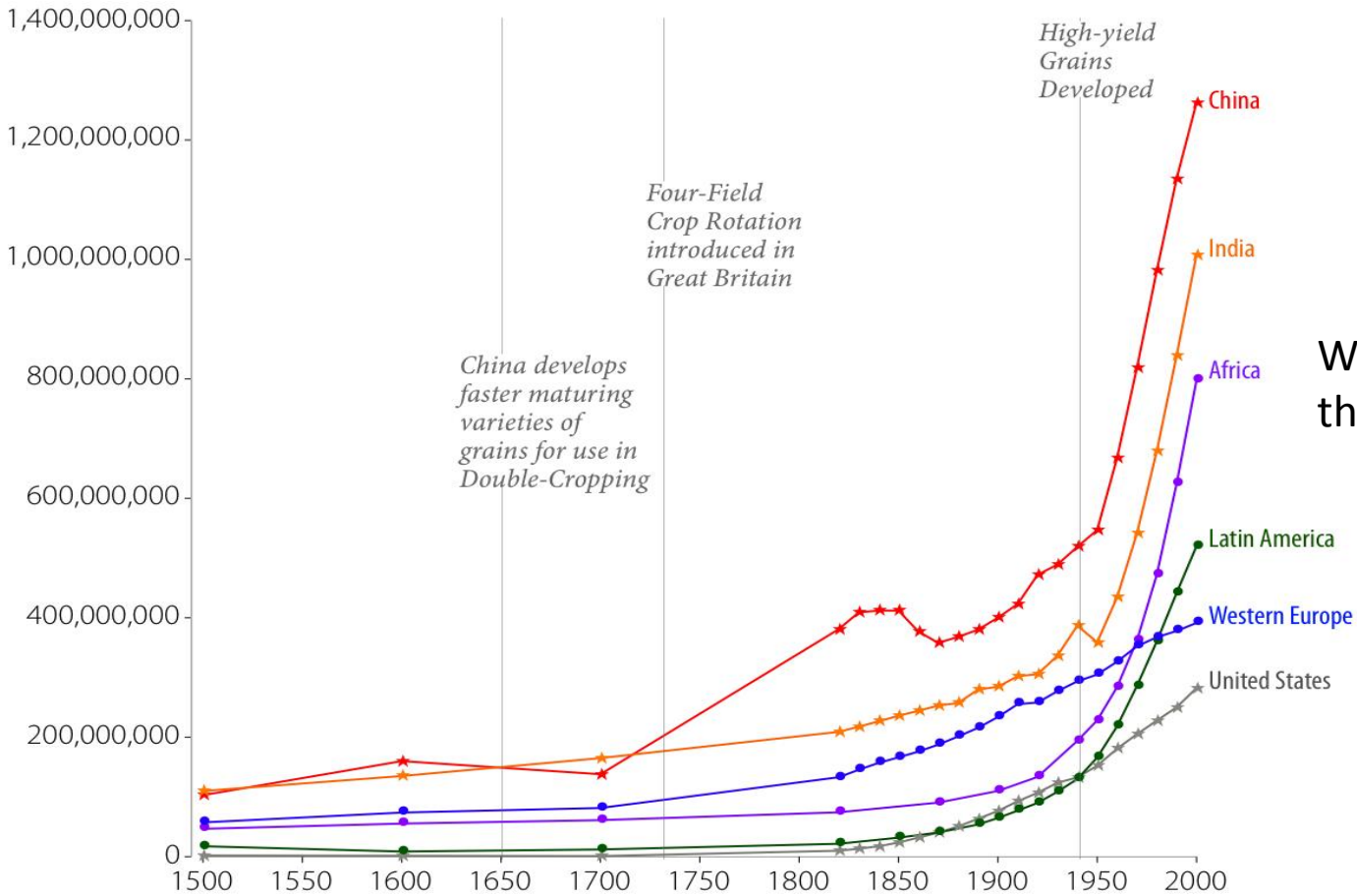


# Populations

- Exponential growth – of a population of organisms occurs when the number of organisms increases by an ever-increasing rate.
- Results in population explosion.
- J-shaped curve – under ideal conditions, a population's size would continue to increase indefinitely. This increase can be shown graphically and resembles the letter *J*.
- Fortunately, population size does have a limit.

## Population Growth over the Last 500 Years

China, India, Africa, Latin America, Western Europe, and United States



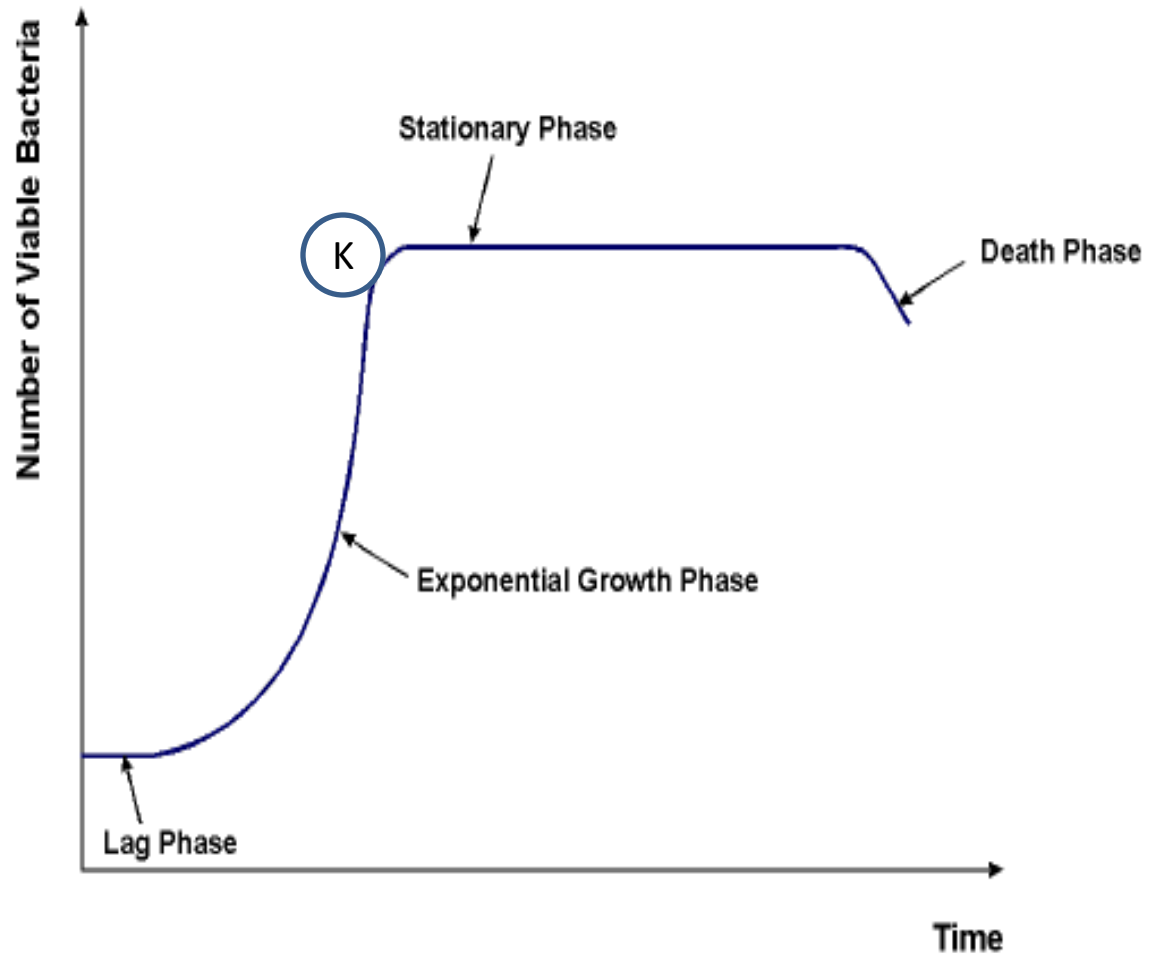
What type of curve are these?

**J - shaped**

# Populations

- Logistic Growth
- S-shaped curve – When population growth **levels** off at a carrying capacity (K) of the environment a **S** shaped curve will appear graphically.
- Carrying capacity – is the number of organisms of a population a particular **environment** can support over an indefinite period of **time**.

# S-Shaped Curve



What does the K represent?

# Populations

- Factors that limit population growth. (food availability, space, extreme temperature and even storms).
- 2 types of limiting factors
  1. Density-dependent factors – factors that limit population density; includes disease, competition, and parasites
  2. Density-independent factors – weather related occurrences affect populations; include floods, storms, temperature and droughts

# Populations



What if the guy in the circle had an extremely contagious airborne disease?

How many around him are going to contract the disease?

A lot of people will contract the disease because of the close proximity he is to others.

# Populations

- Populations are not limited only by environmental factors, but are also controlled by various interactions among organisms that share a community.
- **Predation** and crowding / stress can also affect populations.

How is the lion controlling the population of the wildebeest?

